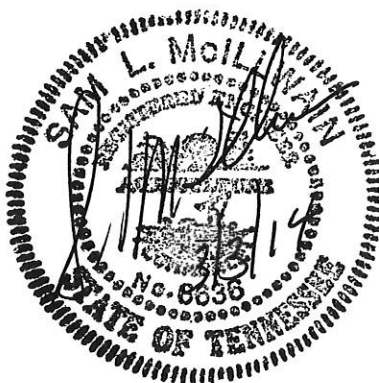


CITY OF MT. JULIET, TENNESSEE
STANDARD SEWER SPECIFICATIONS
FOR SUBDIVISIONS AND
GENERAL SYSTEM ADDITIONS

FEBRUARY 2014



**TN DEPT OF ENVIRONMENT
AND CONSERVATION**
MAR 07 2014
**DIV OF WATER RESOURCES
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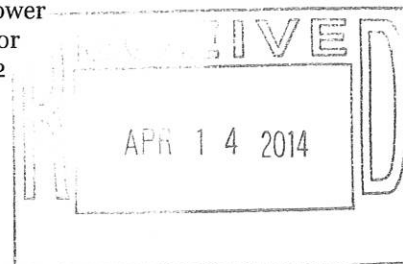
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✓ # 13108



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES

William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102



April 7, 2014

Mr. Tim W. Graves
Water Management Services, L.L.C.
e-copy: tgraves@wmsengineers.com
Suite 401, 2 International Plaza
Nashville, TN 37217

Subject: **City of Mount Juliet**
County: Wilson
Wastewater Project Number: 14-0136
Project: Standard Sewer Specifications for Subdivisions and General Systems

Dear Mr. Graves:

The Tennessee Department of Environment and Conservation, Division of Water Resources, acknowledges the receipt of 4 sets of your documents on March 7, 2014.

Review of your standard sanitary sewer specifications shows that they are in conformance with our guidelines. Therefore, they have been stamped "APPROVED". We are returning 3 copies to you and retaining one copy for our files.

To expedite matters, please reference the assigned wastewater project number 14-0136 on any future correspondence. If we may be of any assistance, please feel free to contact Mr. Adnan Bahour at (615) 532-0638 or by E-mail at Adnan.Bahour@tn.gov.

Sincerely,

Vojin Janjić
Manager, Water-Based Systems

cc: Water-Based Systems File
Mr. Marlin Keel, Director, City of Mt. Juliet, Dept. of Public Works, mkeel@cityofmtjuliet.org
Ms. Ann M. Morbitt, Unit Manager, TDEC Division of Water Resources, Ann.Morbitt@tn.gov

DIVISION A

STANDARD SEWER SYSTEM SPECIFICATIONS

STANDARD SEWER SYSTEM SPECIFICATIONS

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SECTION 1 - GENERAL

1.1 DEFINITIONS

Sewer Department - Mt. Juliet Department of Public Works

City - City of Mt. Juliet, Tennessee

Planning Commission - Mt. Juliet Planning Commission

Developer - Owner of a proposed development in which sewer lines are to be located.

Contractor - Contractor who is installing sewer lines in a proposed development.

Engineer - One who has prepared the construction plans and specifications for the installation of sewer lines in a proposed development. As provided by the laws of Tennessee, he must be a registered professional engineer and plans and specifications must bear his official seal.

State Health Department - Tennessee Department of Environment and Conservation
Division of Water Resources

1.2 SCOPE OF REGULATIONS

These regulations shall apply to any person, developer, firm, business or entity interested in and desiring to construct additional sewer lines or to extend sewer lines within the City of Mt. Juliet's service boundaries, or to construct additional sewer lines or extend sewer lines in a way that affects the sewer service provided by the City.

1.3 PLAN REVIEW PROCEDURE

Before any connection is made to a sewer line of the Sewer Department, the Developer or other party through his Engineer shall submit and receive approval of his proposed plan. The submittal shall consist of neat, scale drawings and specifications in at least three (3) copies, two (2) of which will be retained by the Sewer Department with the remainder to be returned to the Engineer. Plans will not be deemed approved until the Sewer Department's stamp of approval has been affixed to the cover sheet of the drawings and specifications.

The approval of the Sewer Department must be obtained before submittal of the plans and specifications to the Tennessee Department of Environment and Conservation (TDEC), and both approvals must be obtained before construction is started. Evidence of TDEC approval must be furnished to the Sewer Department before final approval for such developments will be granted by the Planning Commission.

Plan submittal procedure shall be as follows:

1. All plans shall be submitted to the Sewer Department with a letter of transmittal for the plan review.
2. The Sewer Department will review the plans and specifications and submit them to the Department's Engineers for their review and comments.

All conventional gravity sewers shall be designed and constructed to give mean velocities when flowing full of not less than 2.0 feet per second. The following minimum slopes should be provided; however, slopes greater than these are desirable:

| <u>Sewer Size</u> <u>inches</u> | <u>Minimum Slope</u> <u>(feet per 100 feet)</u> |
|------------------------------------|--|
| 8 | 0.40 |
| 10 | 0.28 |
| 12 | 0.22 |
| 14 | 0.17 |
| 15 | 0.15 |
| 16 | 0.14 |
| 18 | 0.12 |
| 21 | 0.10 |
| 24 | 0.08 |
| 27 | 0.07 |
| 30 | 0.06 |
| 36 | 0.05 |

Pumping stations and Grinder Pumps shall be by the same manufacturer as the equipment being utilized by the City. Design discharge velocities shall be such as to create self-cleansing conditions in the force main. A valve and coupling shall be provided in the valve pit to hook up portable pump(s) to the force main in the event of an emergency. Suitable air release valves shall be utilized at all points in the force main subject to an accumulation of air or gases released from the sewage.

Pumping facilities will be required to have full standby capacity, high water - power failure alarm system, flow meters in some cases, and elapsed time meters for all pumps in all cases, water supply for maintenance and other items as determined in reviews for individual installations. Pump stations must be provided with all-weather roads for access for maintenance vehicles.

For sewage pumping installations, the following pumps are generally approved for use in the System (subject to detailed design review of each project):

Aurora
Fairbanks-Morse
Flygt
Gorman-Rupp
Smith and Loveless
F. E. Myers

Preliminary discussions concerning pump station design are encouraged before preparation of preliminary plans so specific design requirements can be established.

Note: All wet well mounted pump station enclosures shall be hinged on one end or clam shell type hinged on both ends or fully sliding type on a concrete slab such that the enclosure opens or slides completely out of the way for easy access to the facilitate maintenance by the Owner.

All wet well mounted pump stations shall have a non-corrosive base of 316 stainless steel or non-corrosive fiberglass encapsulated concrete base over the wet well structure. All suction and discharge piping inside the wet well shall be DR-9 HDPE piping with joint

approximately ten (10) feet outside the wastewater pumping station wet well structure. This installation shall include a concrete "dead-man" anchor to restrain discharge piping and plug valve as per special Detail No. S-22.

Pipe Material shall be as designated on approved construction drawings and shall conform to applicable specifications included in Section 2 of these Standard Specifications. The Engineer shall, therefore, designate pipe materials on all construction drawings.

Separation of Water Mains and Sewers shall be maintained in accordance with the following guidelines:

For parallel installations, line separation is to be at least 10 feet edge to edge. If this cannot be obtained, the bottom of the water line shall be at least 18 inches above the top of the sewer. If this condition is also unobtainable, the sewer line is to be constructed of materials and have a joint design equivalent to water main standards as approved by the Water Department and shall be pressure tested to 50 psi to assure watertightness.

Where the water line crosses house sewers, storm sewers, or sanitary sewers, a separation of at least 18 inches shall be provided between the bottom of the water line and the top of the sewer. If this separation cannot be obtained, sewers within 10 feet of the water line shall be constructed of materials and have a joint design equivalent to water main standards as approved by the Water Department. Such sewer lines shall be pressure tested to 50 psi to assure watertightness. Water mains passing under sewers shall be protected (in addition to the above sewer line construction) by providing: at least 18 inches between the bottom of the sewer and the top of the water line; adequate structural support of the sewer to prevent excessive joint deflection or damage to the water line; centering of the water line section to result in the water line joints being removed from the sewer line to the maximum possible extent.

No water line shall pass through or come into contact with any part of a sewer or sewer manhole.

All gravity sewer lines shall have a minimum cover of four (4) feet in roadway/driveway areas and a minimum cover of 2-1/2 feet in non-roadway areas.

Easements - When sanitary sewers are constructed outside a public right-of-way, easements must be provided using the following:

| <u>Sewer Depth (feet) *</u> | <u>Easement Width Required (minimum)</u> |
|-----------------------------|--|
| 0-12 | 20 feet |
| 12-20 | 30 feet |

Such easements shall be designated as "Sanitary Sewer Easements."

* No sewer allowed deeper than 20 feet without special approval by the City of Mt. Juliet. Also, any 8-inch to 10-inch sewer over 12 feet deep (to the invert of sewer) to be constructed using DUCTILE IRON PIPE. In addition, DUCTILE IRON PIPE shall be required for sewer lines in engineered fill sections.

Larger gravity interceptor sewers (12-inch in diameter and over) 12 feet deep (to the invert of sewer) and sewer services of these mains shall be minimum thickness equal to

The Contractor shall prepare logs and video tapes with audio sound detailing the information mentioned above and giving the distance of each of the manholes. Copies of the television survey logs and video/audio DVDs shall be provided to the Owner for review and records.

The television camera to be used shall be specifically designed and manufactured for pipeline inspections. The camera shall have sufficient lighting for a clear picture of the entire pipe and be capable of operating in 100 percent humidity. The entire video system and components shall be capable of producing a minimum 500 line resolution video picture. The picture quality and definition shall be to the satisfaction of the Engineer.

NOTE: The television camera shall be equipped with a pivoting head capable of directing the camera up the service line for inspecting sewer services flowing into the main line sewer.

The camera shall be measured from the manhole by both electrical and mechanical meters. These measurements shall be recorded on the log for all data entered. Measurement must be accurate for connections and defects found. The measurement meters shall be accurate to within 0.2 of a foot over the length of a manhole segment. Should the Contractor use remote power winches for pulling the camera, radios or telephones shall be provided for communication between the manholes.

The Contractor shall not fail to remove all strings or other debris used in stringing the sewers to be televised, nor shall this material be allowed to go downstream in the Owner's existing sewer system.

Any defects or deficiencies discovered by this internal television inspection shall be corrected by the Contractor/Developer under the Warranty provisions of the Contract and before final acceptance of the sewerage facilities. Additionally, any defects or deficiencies discovered shall be corrected before any reductions and/or release of the Letter of Credit and at no cost to the City of Mt. Juliet.

1.9 FINAL ACCEPTANCE

When facilities qualify as public facilities, the Sewer Department will accept ownership of the completed facilities when the work has passed the final inspection and when final drawings are submitted to the Sewer Department reflecting actual "AS-BUILT" conditions. The "AS-BUILT" drawings shall be complete and show final location of sewer lines, manholes, services, and other items appurtenant to the system. Three (3) sets of "AS-BUILT" drawings shall be submitted to the Sewer Department before final acceptance of the work is made.

Final acceptance by the Sewer Department will be made in writing upon satisfactory completion of the project including final inspection, submittal of "AS-BUILT" drawings, submittal of all required dedication of easements, and payment of all fees due. The Developer shall guarantee the work for a period of one year from the date of final acceptance and shall immediately correct any deficiencies in the work due to materials and/or workmanship which occur during the guarantee period. The date of final acceptance shall be that date on which the Developer has fulfilled all conditions necessary for final acceptance including passing a final inspection, submittal of "AS-BUILT" drawings, submittal of all required dedication of easements, and payment of all fees due.

2.4 PEA GRAVEL

Pea gravel for shaping cradle bedding shall be #4 to 1/2-inch size Ohio River or approved local gravel of similar character.

2.5 MANHOLE FRAMES AND COVERS

Manhole castings shall conform to ASTM Designation A-48, latest revision, Class 30 and shall be free from scale, lumps, blisters, sand holes and defects of every nature which would impair their use. Castings shall be well cleaned, with a smooth tough asphaltic coating. Covers shall be of the solid indented type with the words "SANITARY SEWER" cast in raised letters thereon. Bearing surfaces of frames and covers shall be machined to provide a solid bearing and prevent rocking. Pattern drawings and weights of castings shall be submitted for the approval of the Sewer Department.

Manhole frames and covers shall be equal to those listed below for particular applications.

| | |
|-------------|---|
| TRAFFIC | John Bouchard No. 1155 |
| NON-TRAFFIC | Same as traffic type specified above |
| WATERTIGHT | To be used where manhole casting is subject to flood or submergence by surface runoff |
| | John Bouchard No. 1123 |

Exceptions to the above shall be noted on Construction Drawings.

2.6 MANHOLE STEPS

Steps shall be (1) aluminum equal to #15295 by Alcoa, (2) ductile iron equal to Neenah No. R-1981-Q, or (3) plastic encapsulated steel equal to No. PS 1-45 as manufactured by M. A. Industries, Inc., East Point, Georgia.

2.7 MONOLITHIC POURED-IN-PLACE MANHOLES

Concrete shall be Class D design mix and shall be submitted to the Engineer for approval. Also for each day's pour, two test cylinders should be made and tested in compliance with ASTM 172, ASTM C-31 and ASTM C-39. These testings shall be done by a testing laboratory selected, employed and paid for by the Contractor.

The Contractor shall submit to the Sewer Department his choice of a testing laboratory for their approval. The Contractor shall instruct the testing laboratory to forward copies of the test reports to the Engineer and the Owner.

All manholes constructed and installed on this project shall be cast with XYPEX® Admix C-1000 in the concrete for waterproofing and corrosive protection. The manufacturer's recommended addition rate for Concentrate C-1000 is 3% by weight of cement. XYPEX® Concentrate C-1000 shall be as supplied by Tom Williams; Williams Coating Consultants, Inc.; 1231 Antioch Pike; Nashville, Tennessee.

The maximum depth of manholes shall not exceed twenty feet. The minimum wall thickness for 4'-0" inside diameter manholes shall be 6 inches. The minimum wall thickness for 5' and 6' inside diameter manholes shall be 8 inches.

with heavy bitumastic paint. Loose steps and shrinkage cracks passing through manhole walls shall be cause for rejection.

All manholes constructed and installed on this project shall be cast with XYPEX® Admix C-1000 in the concrete for waterproofing and corrosive protection. The manufacturer's recommended addition rate for Concentrate C-1000 is 3% by weight of cement. XYPEX® C-1000 shall be as supplied by Tom Williams; Williams Coating Consultants, Inc.; 1231 Antioch Pike; Nashville, Tennessee (615) 333-1000. Precast manholes with XYPEX® C-1000 Admix shall be as manufactured by Cloud Concrete Products of LaVergne, Tennessee or Engineer-approved equal. **This requirement for XYPEX® C-1000 shall also apply to formed and/or poured manhole invert and benches.**

Manhole sections showing evidence of cracking, crazing, honeycombing, crumbling or excessive roughness will not be acceptable. Sections with improper cut-outs, misalignments or other defects shall not be utilized in the project.

Precast manhole panel (monolithic) bases may be used. Drawings of the monolithic bases proposed for use on this project must be submitted to the Engineer for approval prior to use. Bases shall have a minimum thickness of 8 inches with a minimum thickness of 2 inches allowed at the invert of the downstream pipe for the construction of the invert.

Manhole sections shall be steam or water cured and shall not be delivered to job site until at least 7 days old. Each section shall be marked in a permanent manner with date of manufacture, manufacturer's mark, and manhole location or manhole number. Manhole sections to receive pipes shall be furnished with appropriate cut-outs with resilient connectors for installation of pipe.

On precast manhole sidewall, an approved flexible plastic gasket equal to RAM-NEK shall be applied to the joint surface to placement of next manhole section. The placement of this gasket shall also be required under all manhole castings and adjustment rings for castings.

Testing and Inspection of precast manhole sections shall be done at the site of manufacture in accordance with ASTM C-478 by the Manufacturer. Compression tests shall be run on specimens obtained from each day's production: a minimum of 2 cylinders or cores per day's run but no less than the maximum number designated by ASTM C-478. The absorption test shall be run on a minimum of 2 randomly selected manhole sections per each day's production. Certified test reports shall be submitted in three (3) copies to the Engineer.

In addition to testing required of the manufacturer as described above, the Owner may provide an independent testing laboratory to make visual inspections of manhole sections produced from selected sections. The random samples will be selected by the Owner's testing laboratory and will be taken from stock on the manufacturer's yard intended for use on this project. Core samples shall be cut from designated sections amounting to no more than 4% of the total production in order to run compressive strength and absorption tests. The manufacturer shall cut the cores and seal the holes, but this testing shall be done by the Owner's testing laboratory and paid for by the Owner. In the event the samples fail to conform to the Specifications, the manufacturer may furnish additional test specimens to the extent permitted by the Specifications. Testing done by the Owner's testing laboratory shall be in accordance with ASTM C-478, latest revision.

indicate the manufacturer, date of manufacture, the pipe class and weight. Exterior markings shall also positively identify the pipe as being Ductile Iron.

Ductile iron pipe shall be furnished with wall thickness in accordance with the following schedule (or heavier), unless noted otherwise on the Drawings (Thickness Class 50).

| | |
|-----|-------|
| 8" | 0.27" |
| 10" | 0.29" |
| 12" | 0.31" |
| 16" | 0.34" |
| 18" | 0.35" |
| 20" | 0.36" |
| 24" | 0.38" |
| 30" | 0.39" |
| 36" | 0.43" |

Ductile iron pipe for force mains shall be at least Thickness Class 51, unless shown otherwise on the Drawings.

Ductile iron pipe on piers or in tunnels or bores shall be at least Thickness Class 52, unless shown otherwise on the Drawings.

Restrained joint pipe shall be provided. Such restrained joints shall be American Flex-Ring, U.S. Pipe Lok-Tyton, or equal.

All ductile iron pipe shall be first quality, with manufacturer's identification and pipe class clearly shown on each section.

Pipe manufacturer shall furnish, upon request, the test data for quality control during the manufacturing period for pipe furnished on the project. Testing and inspection shall be in accordance with ASA A.21.51. Tests to include hydrostatic test (500 psi - 10 sec.); tensile test; impact test; one sample to be taken during each casting period of approximately 3 hours.

2.12 IRON PIPE FITTINGS

All fittings shall be compact ductile iron, cement lined, bituminous coated, manufactured in accordance with USA Standards A21.53-84, latest revision, unless otherwise indicated or directed. Minimum pressure rating shall be 350 psi. Unless indicated otherwise on the Drawings, mechanical joint fittings shall be used.

Fitting manufacturer shall furnish certificates that fittings were manufactured in compliance with ANSI A21.53-84, latest revision.

2.13 RIVER CROSSING PIPE

Ductile iron river crossing pipe used for the river crossing shall be Lok-Fast as manufactured by American Cast Iron Pipe Company, F-28 Super-Lock as manufactured by Clow or equal. River crossing pipe shall be furnished with Thickness Class 52, unless noted otherwise on the Drawings.

River crossing pipe shall conform to all items under Paragraph 2.12 - Ductile Iron Pipe of these Specifications except for class thickness and joint type.

Joints shall be compression type utilizing an elastomeric gasket providing a positive seal against groundwater and root intrusion as well as sewage leakage and shall be in accordance with ASTM D-3212. Gaskets shall comply with physical requirements specified in ASTM F-477, latest revision. Lubricant shall be furnished with the gaskets and shall be entirely compatible with gasket and pipe material.

Joints shall show no signs of leakage when tested in accordance with Specification D-3212). Typical joint assembly and each pipe shall be subjected tests in full compliance with ASTM F-1830, latest revision.

Testing and inspection of all pipe shall be done at the factory with a certified copy of test results furnished to the Engineer prior to any pipe being installed. Tests shall be done in accordance with ASTM F-1803, latest revision, and shall include: Pipe and Fitting Dimensions; Pipe Flattening; Impact Resistance; Pipe Stiffness; Joint Tightness; and Extrusion Quality. At least 1% of the production of each size furnished for this project shall be tested.

Each pipe section shall be marked with the following information:

21-inch to 60-inch:

Manufacturer's name or trademark; nominal pipe size; PVC cell classification D-1784; Legend "PS 46 PVC Sewer Pipe"; ASTM F-1803.

Extreme care shall be taken by the Contractor when hand lining PVC closed profile pipe and when bedding. Bedding for PVC pipe shall be #67 compacted crushed stone under and over the pipe (Type 5 trench condition).

Note: For sewers exceeding 12 feet deep, the PS rating shall be PS 115.

2.16 POLYVINYL CHLORIDE (PVC) PRESSURE SEWER

PVC pressure sewer pipe shall conform to Class 200 rating or heavier manufactured in accordance with ASTM D-2241, latest revision. All pipe shall be manufactured from Class 12454-B polyvinyl chloride plastic (PVC 1120) as defined by ASTM D-1784. The pipe shall have NSF approval. The following tests shall be performed for each machine and on each size and type of pipe being produced with test results furnished to the Engineer prior to any pipe being installed.

Flattening Test - Once per shift in accordance with ASTM D-2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.

Acetone Test (Extrusion Quality Test) - Once per shift in accordance with ASTM D-2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the tests.

Quick Burst Test - Once per 24 hours in accordance with ASTM 1599.

| <u>SDR</u> | <u>Pressure Rating</u> | <u>Minimum Bursting Pressure, psi</u> |
|------------|------------------------|---------------------------------------|
| 13.5 | 315 | 1,000 |
| 17 | 250 | 800 |
| 21 | 200 | 630 |

2.17 POLYVINYL CHLORIDE (PVC) PRESSURE SEWER FORCE MAIN PIPE

AWWA C-905 PVC force main pipe (DR-21; 200 PSI; w/cast iron pipe equivalent OD's) shall conform to ANSI / AWWA C-905 manufactured in accordance with ASTM D2241, latest revision. All pipe shall be manufactured from Class 12454-B Polyvinyl chloride plastic (PVC 1120) as defined in ASTM D-1784. The pipe shall have NSF approval. The following test shall be performed for each machine and on each size and type of pipe being produced with test results furnished to the Engineer prior to any pipe being installed.

Flattening Test - Once per shift in accordance with ASTM D-2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.

Acetone Test (Extrusion Quality Test) - Once per shift in accordance with ASTM D-2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the tests.

Quick Burst Test - Once per 24 hours in accordance with ASTM 1599.

Wall Thickness and Outside Dimensions Tests - Once per hour in accordance with ASTM D-2122.

Bell Dimension Test - Once per hour in accordance with ASTM D-3139.

In addition to the above, the pipe manufacturer shall furnish a certificate stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these Specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimensions, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these Specifications.

All pipe shall be manufactured in the United States of America. All pipe for any one project shall be made by the same manufacturer.

The pipe may be furnished in the manufacturer's standard laying lengths of 20 feet. The Contractor's methods of storing and handling the pipe shall be approved by the Engineer. All pipe shall be supported within 5 feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed water line routes will not be allowed.

Certain information shall be applied to each piece of pipe. At the least, this shall consist of:

- Normal Size
- Type of material
- SDR or class
- Manufacturer
- NSF Seal of Approval
- AWWA C-900

Pipe that fails to comply with the requirements set forth in these Specifications shall be rejected.

Testing and inspection of all pipe shall be done at the factory with a certified copy of test results furnished to the Engineer prior to any pipe being installed. Tests shall be done in accordance with ASTM D-2837 and validated in accordance with latest revision of PPI TR-3. The Owner may take random samples and have them tested by an independent laboratory. Samples that fail to comply with the requirements set forth in these Specifications shall be rejected.

Pipe and fittings shall be manufactured in accordance with ASTM F-714. Pipe and fittings shall be butt fusion type meeting the requirements of ASTM D-3261. All fittings shall be pressure rated to match the system piping and the outside diameter and minimum wall thickness shall meet the outside diameter and minimum wall thickness specification of ASTM F-714.

The joining method shall be done in strict accordance with the pipe manufacturer's written instructions. The pipe manufacturer shall provide a minimum of 16 hours of instruction time to observe and instruct the Contractor's personnel in the proper pipe joining method and installation of the pipe system. In addition, the pipe manufacturer shall provide a minimum of 8 hours of observation time throughout the duration of the pipe laying operation of the project. The pipe manufacturer shall provide a written report to the Contractor and to the Engineer of his observation including comments on proper procedure being followed.

Pipe and fittings shall be stored and handled in accordance with the manufacturer's recommendations. At a minimum, pipe and fitting shall be stored on clean, level ground to prevent damage. Any sections found to have cuts or gouges shall not be installed and such sections shall be removed from the project.

The polyethylene pipe and fittings shall be not less than the DR class or pressure class listed below. This is based on hydrostatic design basis at 73.4 degrees F.

| <u>Nominal Pipe Size</u> | <u>O.D. of Polyethylene</u> | <u>DR and Pressure</u> |
|------------------------------|-----------------------------|------------------------|
| 4" | 4.80" | DR-9: 200 PSI |
| 6" | 6.90" | DR-9: 200 PSI |
| 8" | 9.05" | DR-9: 200 PSI |
| 12" | 13.20" | DR-9: 200 PSI |

Fittings for PE piping shall be molded (PE) (or fabricated if molded not available) with electrofusion couplings in accordance with manufacturer's recommendations.

All fittings shall be pressure rated to match the piping.

Prior to ordering pipe, fittings, or detectable tape, the Contractor shall submit proposed materials to the Engineer for approval.

2.19 SEWER FITTINGS AND ADAPTERS

Fittings and adapters for use with PVC or ductile iron pipe shall be manufactured in accordance with the Specifications for the respective types of pipe. Note: All couplings for PVC mainline and sewer service pipe shall be provided with stainless steel backed shear protection as manufactured by Mission or Fernco.

(See Standard Detail Drawing S-9)

2.25 COMBINATION AIR RELEASE AND AIR RELIEF/VACUUM VALVE FOR SEWAGE FORCE MAINS 4-INCH AND LARGER

Combination Air Release and Air/Vacuum Valve shall be ARI Model #D-020 in stainless steel material as supplied by Hayes Pipe Supply, Inc. of Nashville, Tennessee.

(See Standard Detail Drawing S-13)

2.26 VALVE BOXES FOR PRESSURE SEWER BALL VALVE WITH TWO DIRECTIONAL CLEAN-OUT ASSEMBLIES

These boxes shall be traffic rated in accordance with Standard Detail Drawing S-6.

2.27 VALVE BOXES FOR PRESSURE SEWER SERVICE CONNECTION ASSEMBLIES

Valve boxes for pressure sewer valves, cleanout and service connections shall be a standard plastic meter box with a nominal size of 16" x 10-3/4" x 12" and 6" extensions. The meter box shall be injection molded meeting ASTM D-2853-70, Class 1212. It shall be a rigid combination of polyolefin with inorganic component reinforcing and UV stabilizer additive to assure resistance to material degradation from ultraviolet light. The cover shall be molded of the same material and design with no molded protrusions for latching. **A 2-1/2-inch diameter 16-gauge steel reflector with dichromate coating shall be applied to the underside of the plastic cover for electronic detection.** The cover shall be green with the words "SEWER" imprinted on the top. **If valve box is located in a roadway or roadway shoulder subject to traffic, then valve box shall be constructed of cast iron.**

2.28 VALVE BOXES FOR ALL OTHER VALVES AND GRAVITY SEWER SERVICE ASSEMBLIES

Valve Boxes - Valve boxes are to be made of pre-cast concrete sections measuring 11" x 13-1/4" inside dimensions and 17" x 19-1/4" outside dimensions with the height of 12 to 15 inches. Reinforcement shall be placed and shall conform to the requirements of ASTM A-15 and ASTM A-305 for intermediate grade.

Footing blocks for standard concrete valve boxes are to be pre-cast in blocks measuring 12" x 12" x 4". No reinforcing steel is required in footing blocks.

Valve Box Frames and Covers shall be made of heavy cast iron and shall meet the requirements of ASTM A-48, Class 40.

All casting shall be made accurately to the required dimensions and shall be sound, smooth, clear and free of blemishes or other defects. Defective castings which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces of frames and covers to be machined so that the covers rest securely in the frames with no rocking. The cover shall be in contact with the frames for the entire perimeter of the contact surface.

The valve box frames and covers shall be as manufactured by Bouchard No. 8006, Roadway Type, Nashville Standard or equal. The cover shall be marked "SEWER"

(See Standard Detail Drawing S-19)

2.32 PROVIDING MANHOLE (DISH) INSERTS FOR INFLOW PROTECTION

The Contractor/Developer shall provide (furnish at time of final testing) "inflow protector manhole inserts" on fifteen percent (15%) of all new manholes within each Development with the exception of watertight F&C's and the end-of-line manholes which shall be equipped with a manhole cover with vent holes. The manhole insert shall be as manufactured by Syneco Systems, Inc., of Chanhassen, MN; or, Parson Environmental Products, Inc., of Reading, PA, or Owner/Engineer approved equal. See Standard Detail Drawing S-21.

2.33 PROVIDING MANHOLE FRAME-CHIMNEY SEALS FOR INFLOW PROTECTION

The Contractor/Developer shall provide "Flex-Rib Frame-Chimney Seals" on ten percent (10%) of all new manholes within each Development to seal the area between the manhole casting frame and the pre-cast manhole frame. The minimum height shall be 12-inches. The manhole frame-chimney seal shall be a "Flex-Rib Frame-Chimney Seal as manufactured by Trelleborg Pipe Seals Milford, Inc., of Milford, New Hampshire 03055, or Owner/Engineer approved equal. See Standard Detail Drawing 21.

2.34 PREFABRICATED GRINDER SEWAGE PUMP STATIONS

2.34.1 General

All grinder sewage pumps shall be in strict compliance with the latest requirements of the City of Mt. Juliet, Department of Public Works.

The Contractor shall furnish and install a factory-built simplex or duplex grinder pump station consisting of either locations shown on the Drawings or as directed by the Engineer.

The Contractor shall be responsible for all material furnished by him and shall replace, at his own expense, all such material found defective in manufacture or damaged on delivery. This shall include the furnishing of all material and labor required for the replacement of installed material discovered defective.

The Contractor shall be responsible for the safe storage of material furnished by him until it has been incorporated in the completed project. All motors and electrical and mechanical components shall be stored in a dry environment. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

Note: All guide rails, lifting chain/cables, brackets, etc. inside the pump station basin shall be of non-corrosive materials such as stainless steel, fiberglass, etc.

2.34.2 Products

Grinder Pump: The manufacturer shall furnish a factory-built simplex or duplex grinder pump station consisting of either one or two grinder pump units as applicable with mercury switch level controls, discharge piping, pump mounting plates with bottom rail supports, upper rail supports or guide rails, a quick disconnect coupling, lifting chain, reinforced fiberglass pump cover plate, and all necessary parts and equipment installed in a fiberglass reinforced polyester tank as described in the following specifications. The discharge piping and/or check valves shall be so designed as to prevent siphoning of wastewater from the pump basin when conditions of negative pressure exist at the point of connection

electrical connection which is completely watertight, yet may be easily removed for service.

The combination centrifugal pump impeller and grinder unit shall be attached to a common motor and pump shaft made of stainless steel. The grinder unit shall be on the suction side of the pump impeller and discharging directly into the impeller inlet leaving no exposed shaft to permit packing of ground solids. The grinder shall have two stages or have grinding impeller and shredding ring. Both stationary and rotating cutters shall be made of hardened and ground stainless steel. Pump and motor housings are to be high quality gray iron castings. Impeller shall be bronze. All fasteners shall be of a high grade stainless steel.

The pump motor shaft shall be sealed by two mechanical carbon and ceramic faced seals within an oil-filled chamber to provide clean, constant lubrication. The shaft shall be supported by a ball radial and thrust bearing and a lower bronze radial sleeve bearing between the shaft seals to minimize overhang, both running in oil.

The motor winding and rotor are to be mounted in a sealed, submersible type housing which is filled with clean high-dielectric oil for bearing lubrication and to transmit heat from motor winding to outer housing. Motor winding shall be securely held in the housing with machine screws or it shall be pressed into the housing.

Controls for Simplex Station:

Sealed float type mercury switches shall be supplied to control sump level and alarm signal. The mercury tube switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy neoprene jacket and a weight shall be attached to cord above the float to prevent sharp bends in the cord when the float operates under water.

The float switches shall hang in the sump supported only by the cord that is held to the NEMA 4 fiberglass junction box. Two float switches shall be used to control level. One for pump turn-on, one for pump turn-off, and a third switch shall be provided for alarm control.

A red alarm light is to be supplied for mounting on the control box.

The light shall consist of a 40-watt high-intensity bulb and a red polycarbonate lens with a neoprene gasket. The alarm light will flash to indicate a high-water condition and go out when the water level drops.

Operation of Simplex System

On sump level rise, the lower mercury switch shall first be energized, then upper level switch shall next energize and start pump. With pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. If level continues to rise when pump is operating, the alarm switch shall energize. All level switches shall be adjustable for level settings from the surface.

Electrical Control Panel for Simplex Station:

Control panel shall have a NEMA 3R/12 weatherproof enclosure. A lock hasp shall be provided on door. A circuit breaker shall be provided for the pump and a

strip shall be provided for connecting pump and control wires. Additional terminals shall be provided to connect alarm. Control circuit shall be 115V or a transformer shall be supplied to give 24V control circuit. The control panels shall be provided with a disconnect switch that will permit the servicing of the various electrical components without such components being subject electrical power.

Note: Control panel must be UL listed as a complete unit.

Wiring:

It shall be the responsibility of the electrical contractor to furnish and install, according to the plans and in compliance with appropriate national and local codes, the branch circuit protection and all wiring to the pump leads and to the high-alarm indicator lamp.

Corrosion Protection:

All materials exposed to wastewater shall have inherent corrosion protection: i.e., cast iron, fiberglass, stainless steel, PVC. Any exterior steel surfaces are to be suitably protected against corrosion.

Serviceability:

The grinder pump unit shall have provisions for lifting to facilitate easy removal of the unit from the tank if necessary.

Manufacturer:

The equipment specified shall be the product of a company experienced in the design and manufacture of grinder pumps for specific use in low-pressure sewage systems. The company shall submit detailed installation and user instructions for its product; submit evidence of an established service support program including complete parts and a service manuals; and be responsible for maintaining a continuing inventory of grinder pump replacement parts.

Warranty:

The manufacturer shall warrant its product to be free from defects in material and factory workmanship for a period of one year from date of acceptance. Repair or parts replacement required as a result of such defects will be made free of charge during this period.

The manufacturer will provide the General Contractor specific instruction on the assembly and installation of the pump stations and related equipment.

The manufacturer will furnish, at his own expense, the services of a factory trained serviceman to instruct the Owner's personnel in the operation and maintenance of the pumps and related equipment. The individual performing the instruction to the Owner is to be trained and/or certified by the manufacturer as its authorized operation, maintenance, and service specialist. Allow a minimum of three days on at least two separate trips for this instruction. The schedules of the visits are to be approved by the Engineer.

SECTION 3 - CONSTRUCTION

3.1 GENERAL

The streets, roads, and easements in which lines shall be placed have been indicated on the Drawings. Any change from locations approved by the Sewer Department shall be approved by the Sewer Department before construction.

Where the excavation exceeds the required depth, the Contractor shall bring the excavation to proper grade through the use of an approved incompressible backfill material (generally crushed stone or fill concrete, depending upon the nature of the facility to be placed thereon). In the event unstable soil conditions are encountered at the bottom of the excavation, the Engineer will direct the Contractor to continue the excavation to firm soil or to provide pilings or other suitable special foundations, with such action subject to approval by the Sewer Department.

The Contractor shall take such precautions as may be necessary to avoid endangering personnel, pavement, adjacent utilities or structures through cave-ins, slides, settlement or other soil disturbance resulting from his operations and shall comply with government regulations.

Backfilling shall be carried out as expeditiously as possible but shall not be undertaken until the Owner's Representative has been given the opportunity to inspect the work. The Contractor must carry out all backfilling operations with due regard for: the protection of pipes, structures and appurtenances; the use of prescribed backfill materials; and procedures to obtain the desired degree of compaction.

All shade trees, telephone poles, power poles, etc. along the line of work shall be protected, and sufficient barricades, lanterns, etc. shall be provided for the protection of the public.

The Contractor shall prepare cut sheets and submit them in quadruplicate for the Engineer's approval. The cut sheets shall have ground elevations at 50-foot intervals and at major changes of the ground profile (ditches, ledges, etc.). One set of the approved cut sheets will be returned to the Contractor. The Engineer shall check cut sheets for consistency with approved construction drawings before construction is started.

Alignment and grade shall be maintained by the use of offset hubs. There shall be at minimum:

- (1) Two (2) alignment and grade offset hubs at each manhole.
- (2) For use with batter boards: At a maximum interval of 50 feet (when sewer grade is less than 1%, maximum intervals shall be 25 feet).
- (3) For use with laser device: At 50 feet and 100 feet out of each manhole.

3.2 TRENCH EXCAVATION

3.2.1 General

Trenching must be done in a neat and workmanlike manner maintaining proper vertical and horizontal alignment. Alignment shall be maintained by the use of offset hubs and batter boards at maximum 50-foot intervals or with a laser device

3.2.2

Rock Excavation

Where rock is encountered, the excavation shall be carried to a depth of 6 inches below the barrel of the pipe, or the bottom of the structure, and the excess excavation shall be backfilled with crushed stone, sand or other approved bedding material firmly compacted. Boulders and large stones, rock or shale shall be removed to provide a clearance of at least 6 inches below all parts of the pipe or fittings and to clear width of at least 6 inches on each side of all pipe and appurtenances.

Where rock is encountered, the Contractor shall "mattress" the trench during blasting operations and shall use all precautions necessary to protect adjacent property against damage resulting from his operations. Rock excavation in proximity to other pipes or structures shall be conducted with the utmost care to prevent damage to the existing structures and any such damage caused shall be promptly repaired at the Contractor's expense. Blasting operations shall not be conducted within 25 feet of finished sewer or water pipe and rock excavation shall be completed at least 25 feet ahead of pipe laying.

Extreme care shall be exercised in blasting with signals of danger given and displaced before the firing of any charge. The Contractor shall, in all his acts, conform to and obey all rules and regulations for the protection of life and property that may be imposed by any public authorities or that may be made from time to time by the Engineer relative to the storing and handling of explosives and the blasting operations. No blasting shall be done at any time except by persons experienced in this line of work.

Where rock is encountered in the immediate vicinity of gas mains, telephone cables, building footings, gasoline tanks or other hazardous areas, the Contractor shall remove the rock by means other than blasting. Care shall be taken in blasting operations to see that pipe or other structures previously installed are not damaged by blasting.

Where rock trenchers are utilized for sewer installations, the Contractor shall excavate the sewer trench a minimum of three feet (3') beyond the end of all sewer services and manhole pipe stub-outs to allow for future tie-ins.

3.2.3

Sheeting and Shoring

The Contractor shall provide such bracing, sheeting or shoring as may be necessary for the protection of life and property, or where such protection is specifically required by the Engineer because of potential danger to life, property or the completed structure. Sheeting will be required where necessary to restrict the trench width to acceptable limits above the top of pipe.

Sheeting, shoring or bracing shall conform to applicable safety codes and shall be left in place until the pipe is laid, checked, and backfilled to a safe level at or above top of pipe. The bracing or sheeting may then be removed in an approved manner unless the Engineer specifically directs that the sheeting be left in place. Where the sheeting is left in place either at the direction of the Engineer or option of the Contractor, the sheeting shall be cut off at least 18 inches below the finished ground level.

Care shall be taken in removing sheeting to avoid weakening the trench, increasing the backfill load, or endangering adjacent property. Voids left by the

Care shall be exercised to ensure that pipe of the proper strength or classification meeting the specifications in every respect is provided at the site of pipe laying operations. Recommended tools, equipment, lubricant and other accessories needed for proper assembly or installation of the pipe shall be provided at the site of the work. Any damaged or defective pipe discovered during the pipe laying operations shall be discarded and removed from the site of the pipe laying operations.

Alignment and grade shall be carefully maintained during the laying operations. The method used for maintaining grade and alignment must be acceptable to the Engineer and the Sewer Department and must produce the desired results. The top of the bedding material must be brought to the exact grade and must be shaped so as to provide effective support for the bottom quadrant of the pipe except at the bells.

The Contractor shall exercise care in the storage and handling of pipe, both on the storage yard and at the site of laying operations. Suitable clamps, slings, or other lifting devices shall be provided for handling pipe and fittings. Pipe and fittings shall be inspected for defects and for dirt or other foreign material immediately before placing them in the trench. Suitable swabs shall be available at the site of laying operations, and any dirt or foreign material shall be removed from the pipe before it is lowered into the trench.

3.3.2

Bedding

It is desired that trench widths from a point 1 foot above the top of the pipe down to the bottom of the trench be held to a minimum consistent with the provisions of necessary space for proper assembly of the pipe. In general, the trench width shall not exceed the nominal pipe diameter plus 16 inches.

A minimum of 6 inches of crushed stone bedding shall be placed in the bottom of the trench to provide continuous support of the bottom quadrant of the pipe. The Contractor shall bring the crushed stone bedding up to the required level to provide support to the bottom quadrant and shall then shape the bedding to receive the pipe. Bell holes shall be dug so that the bottom of the bells will not support the pipe.

After the bedding has been shaped and the pipe has been installed, crushed stone backfill shall be carefully placed by hand and compacted on both sides of the pipe and up to a level 12 inches above the top of the pipe.

In addition to maximum trench width, the selection of pipe has been based on the use of 6 inches of crushed stone bedding to provide continuous support of the bottom quadrant of the pipe plus crushed stone backfill carefully placed and compacted on both sides of the pipe and up to a level 12 inches above the top of the pipe. It is therefore essential that these conditions be observed in the installation of the pipe.

3.3.3

Pipe Laying

Prior to pipe laying, the Contractor shall clean (Crumb-out) bottom of excavation to remove all loose dirt or other over shot loose materials. The subgrade foundation shall then be thoroughly consolidated prior to placement and grading of minimum six (6") inches of compacted crushed stone. The total area under the

supported on concrete piers as detailed on the Drawings or as directed by the Engineer. Piers shall be of Class C concrete with reinforcing as shown. The tops of piers shall be carefully set at the exact elevation and shall be shaped so as to provide support for the bottom half of the pipe with allowance being made for the outside diameter of the pipe plus the thickness of a layer of tarred felt around the outside of the pipe.

After the concrete has obtained satisfactory strength the ductile iron pipe may be installed across the piers using one or more layers of tarred felt between the surface of the concrete and the outside diameter of the pipe. The Contractor may, at his option, install the pipe to exact grade and alignment using temporary supports and then construct the permanent piers for the pipe, provided suitable precautions are taken to avoid any misalignment during the construction of the piers.

- b. Laying Polyvinyl Chloride Pipe (PVC) - Installation of polyvinyl chloride pipe shall conform to ASTM 2321, latest revision. PVC pipe shall be laid on crushed stone bedding and shall be backfilled with compacted crushed stone around and above the pipe as outlined in Paragraph 3.3.2 and 3.8.1. The bedding material shall be shaped to provide continuous support for the PVC pipe throughout its length except at bells. Blocking shall not be used to bring the pipe to grade.

Whenever it is necessary to cut a joint of pipe in order to fit the trench conditions, the cutting may be made with either hand or mechanical saws or plastic pipe cutters. The cut shall be square and perpendicular to the pipe axis. The cut end shall be beveled to as closely resemble the factory bevels as possible.

Unless otherwise indicated or directed by the Sewer Department, fittings shall be of the same material as the pipe line in which they are to be installed. Fittings shall be furnished with joints of the same type used throughout the rest of the pipe line unless such joint shall not be available and the Engineer should approve a substitute type joint. Fittings shall be of the type indicated on the Drawings and shall be the manufacturer's standard conforming to all applicable standard specifications and dimensional tolerances appropriate for the material of construction.

Assemble all joints in accordance with recommendations of the manufacturer.

- c. Installation of Pressure Sewer

Lay the pressure sewer to and keep it at the lines and grades required by the Drawings. All fittings shall be at the required locations and spigots well centered in the bells.

Unless otherwise indicated by the Drawings, all pressure sewers shall have at least 24 inches of cover. No departure from this policy shall be made except at the order of the Sewer Department.

Provide and use tools and facilities that are satisfactory to the Sewer Department and that will allow the work to be done in a safe and convenient manner. Use a derrick, ropes, or other suitable equipment to lower all pipe fittings into the trench one piece at a time. Carefully lower each piece so that

Lay no pipe in water or when it is the Engineer's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, this shall be considered incidental to the project.

Install thrust blocks wherever the force main changes direction (e.g., at tees and bends), at dead ends, or at any other point where the manufacturer recommends and/or the Engineer indicates that they are to be used.

Make all joints, whether standard mechanical or push-on joints, in conformance with the recommendations of the joint manufacturer as approved by the Engineer.

The detectable tape and 14-gauge insulated copper tracer wire shall be buried in the utility line trench directly above the installation to be identified. The tracer wire shall be placed directly on top of the pressure sewer and the marking tape shall be placed 15 inches from finish grade of the trench. The tape shall be placed in the trench with the printed side up and be essentially parallel to the finished surface. The Contractor will take necessary precautions to ensure that the tape and tracer wire are not pulled, distorted, or otherwise misplaced in completing the trench backfill. Tape and wire shall be placed in all trenches.

Note: The Contractor shall stub-up trace wires in all valve boxes, air release assemblies, clean-outs, etc.

Note: The Contractor shall test trace wire for continuity prior to final acceptance of the project.

d. Pressure Sewer Service Assemblies

Materials

Ball Valve: The valve on the service line at the connection to the main shall be a PVC ball valve of true union design as per Material Section of these specifications. The valves are to open and close with a quarter turn.

Working pressure at 70 degrees F shall be 150 pounds per square inch.

Redundant Check Valve: Each service line shall include a check valve for installation in the discharge line between the grinder pump and the pressure sewer to ensure maximum protection against backflow in the event of sewer service line break.

Installation

The service line shall have a minimum of 18 inches of cover.

The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finish pavement or centered over the valve and cleanout or approximately 1/2-inch above the ground surface or such other level as may be directed.

Assembly of the pipe joints shall be in accordance with manufacturer's instructions using gaskets and lubricants supplied by the pipe manufacturer. Pipe fittings shall be provided as indicated on the Drawings or as directed by the Engineer. Fittings shall be suitably braced in accordance with Standard Details to avoid the pipe from being blown apart due to internal pressure. Bracing shall be sufficient to withstand normal operating pressure plus 50 psi with due allowance for the character of soil against which the braces will be placed.

The detectable tape and 14-gauge insulated copper tracer wire shall be buried in the utility line trench directly above the installation to be identified. The tracer wire shall be placed directly on top of the pressure sewer and the marking tape shall be placed 15 inches from finish grade of the trench. The tape shall be placed in the trench with the printed side up and be essentially parallel to the finished surface. The Contractor will take necessary precautions to ensure that the tape and tracer wire are not pulled, distorted, or otherwise misplaced in completing the trench backfill. Tape and wire shall be placed in all trenches.

Note: The Contractor shall stub-up trace wires in all valve boxes, air release assemblies, etc. For force mains 4-inch and larger and where valve boxes and air release assemblies are not closely spaced, the Contractor shall install trace wire stub-up boxes for locating sewage force mains as per Standard Detail No. S-30.

Note: The Contractor shall test trace wire for continuity prior to final acceptance of the project.

3.4 MANHOLES

Prior to setting of manholes, the Contractor shall clean (Crumb-out) bottom of excavation to remove all loose dirt or other over shot loose materials. The subgrade foundation shall then be thoroughly consolidated by "pounding" of backhoe bucket prior to placement and grading of minimum six (6") inches of compacted crushed stone. The total area under the proposed manhole shall carefully stabilized, graded, and compacted to prevent differential settlement of the manhole.

Individual riser section shall be furnished for the exact conditions to be encountered in the field. Misalignment of pipe openings with the "cast in" resilient connectors or steps within the section or with other sections shall be cause for rejection.

Note: For all manholes, the maximum riser height including the casting frame shall be 18 inches. The minimum riser under the casting shall be 6 inches. The maximum amount the frame and cover shall be above pavement grade shall be 1-1/2 inches at any time during the construction period.

Precast manhole sections shall be joined with male and female ends joined together to provide a smooth uniform joint which shall be structurally sound and watertight. A flexible, acid and alkali-sewage and water-resistant sealant equal to Ram-Nek as manufactured by K. T. Snyder Company, Inc. shall be applied to the joint surface for placement of the next manhole section, casting rind, or casting. A maximum of three precast manhole castings rings may be used to adjust the casting to final grade.

number of specials and short lengths of pipe for the Contractor to install the required flexible connections without improvising.

For all situations where connections are made to existing manholes, the connections shall be accomplished by resilient connectors and shall be Kor-N-Seal or approved equal. Where grouting is required around piping entering and exiting manholes, the grout shall be non-shrink hydraulic cement grout.

3.6 CONNECTIONS TO EXISTING SYSTEMS

No pipe shall be connected to the existing sewage system until all new upstream construction has been completed, is free of foreign materials, and obvious defects have been corrected. New lines, then, must remain disconnected from the existing system by actual physical separation, by plugs of a type approved by the Engineer, or by other means approved by the Engineer.

The Contractor shall make connections to existing sewers in accordance with details as shown on the Drawings or as directed by the Sewer Department.

In all cases the Contractor shall locate and uncover existing sewers and shall verify invert elevations before laying the connecting sewer so as to allow opportunity for making adjustments to compensate for discrepancies.

Work shall include any required stopping or diversion of flow in existing lines or structures and the necessary rebuilding of any manhole inverts to the lines shown generally on the Standard Detail sheet.

Note: Special coupling adapters for point repairs on sewer lines and/or joining sewer lines shall provide for shear / differential settlement protection and shall be Mission Flex-Seal ARC sewer couplings as manufactured by Mission Rubber Company or Engineer/Owner-approved equal.

3.7 SERVICE CONNECTIONS

Sewer service lines shall be provided as shown on the Drawings or as directed by the Engineer. Service connections shall consist of tee or wye with 6-inch branch connection, 6-inch bends, 6" x 4" T-Wye, clean-out adapter with threaded clean-out plug, and 4-inch or 6-inch piping as required to complete the sewer service connection. Pipe and fitting joints shall be compression type as used on the main sewer. Service pipe and fittings shall be of the same material as used for the main sewer. Service pipe shall be laid on a slope of 1/4-inch per foot or, where this grade is not available and the Sewer Department specifically approves, 1/8-inch per foot may be used. Sewer service lines shall conform to details as shown on the Standard Detail Drawings and shall terminate at the property line with a tight compression plug braced to withstand pressure of air pressure test.

In the event that it should be necessary to install a service connection where a tee has not been provided, saddles must be used and shall be attached to the main sewer by a cement grout or epoxy in such a way as to effect a permanent watertight joint. The Contractor shall submit for approval the method and materials to be used.

Excavation, laying and backfilling for service lines shall conform to the applicable specifications.

The property line clean-out shall be installed in a precast concrete / cast iron clean-out box assembly as per Standard Detail Drawing contained in the back of these specifications.

In wide deep trenches the Engineer may, at his discretion, permit the use of rock larger than 12 inches in the backfill, provided such rock is carefully placed in such a manner that the final position of the rock will not be within the vertical prism lying directly over the pipe or within 9 inches on either side of the pipe.

In all instances, sufficient care must be exercised to avoid leaving any holes or voids over, around or under stones, boulders, or other backfill material which may later be filled by leaching or settlement of surrounding material thereby causing future trench settlement. Where the Contractor desires to use excavated rock for backfill material and such rock meets the dimensional requirements as specified herein, the Contractor shall provide additional backfill material of a suitable nature to fill the voids as required.

In locations not subject to traffic where excavated material is permitted in the backfill, such material shall be brought up to the original ground level and shall then be mounded over to provide for additional settlement. Compaction of this backfill material will not be required, however, if the Contractor shall exercise care to confine the mound to the area immediately over the trench and shall be responsible for bringing in such additional fill material as may be required from time to time during the one-year warranty period to fill in areas where excessive settlement has occurred.

The Contractor shall be responsible for and shall protect all sewers, storm sewers and electric, telephone, water or other pipes or conduits against danger or damage while the trenches are being backfilled and from future settlement of the backfill. Where such damage should occur as a result of the Contractor's operations, he shall repair such damage promptly.

The Contractor's attention is called to the fact that he will be held completely responsible for any damage to pavement, sidewalks, curbs, gutters, meter or valve boxes, street inlets, or other structure or appurtenances as a result of the Contractor's operations. It should be specifically noted that the Contractor shall be responsible for damage even though the character or nature of the original pavement or structure was such that it was not capable of carrying the load of the construction equipment regardless of the construction methods used.

3.8.2 Backfill at Manholes and Other Structures

Backfill around manholes located in highways, streets, or other traveled areas shall consist of carefully placed granular material. Backfill around manholes, piers or other structures in locations not subject to traffic may consist of excavated material subject to the following restrictions.

- (1) No rock larger than 12 inches in any dimension shall be placed within 6 inches of the manhole walls, or pipes entering or leaving the manhole.
- (2) No rock larger than 12 inches in any dimension shall be placed in the vertical prism above and extending 9 inches outside of the pipe lines.
- (3) Crushed stone shall be used under, around and up to a point 12 inches over the tops of any pipes entering or leaving the manholes. This requirement shall include the inlet pipe for drop manholes.
- (4) Excavated material used for backfill shall be carefully placed in layers and compacted in such manner as to fill voids and prevent excessive settlement.

hours written notice, employ such force and furnish such materials as may be necessary to do the work with cost to be billed to Contractor.

3.11 PREFABRICATED GRINDER, SEWAGE PUMP STATIONS

The Contractor shall refer to material specifications concerning work on this item and Standard Detail Drawings S-10 and S-11.

3.12 CLEAN-UP PROCEDURES AND REQUIREMENTS

The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated until the excavation has been refilled and surfaced.

As soon as the backfilling of any excavation is completed and when in areas of existing development, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of the filling unless otherwise provided in the special specifications. He shall also remove all the pipe and other material placed or left on the street by him except material needed for the replacement of paving, and the street shall be opened up and made passable for traffic. Following the above work, the repairing and complete restoration of the street surfaces, bridges, crossings and all places affected by the work shall be done as promptly as possible.

All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, parkways, railroads, grass plots, yards, etc., and the whole work shall be left in tidy and acceptable conditions. Contractor will be required to re-grass lawns or neutral grounds where trenches are excavated in these locations or where Contractor has damaged lawns or neutral ground by his operations.

The Engineer shall be the sole authority in determining time in which rough and final clean-up shall be prosecuted. Rough clean-up shall consist of removal of rocks larger than 1 foot in any dimension, grading of excess backfill material over pipeline or removal of said material, opening of any drainage device, restoration of any street or roadway to condition so that traffic may safely and conveniently use street or roadway, restoration of pedestrian ways to condition where pedestrians may safely and conveniently use same.

Rough clean-up shall, in general, be prosecuted no later than 1 day after pipe laying and backfilling or no farther behind pipe laying operations than 1,000 feet, whichever time limit is shortest shall govern. Final clean-up consisting of pavement replacement, sidewalk replacement, removal of rocks, hand raking with seeding, strawing, etc. of lawns and neutral grounds, adjusting grade of ground over pipeline, property repairs, and other items shall, in general, be prosecuted no later than 2 weeks after pipe has been laid and backfilled.

3.13 SLOPE PROTECTION AND EROSION CONTROL

This section shall consist of temporary control measures as shown in the Drawings or directed by the Engineer during the life of the Contract to control erosion and water pollution through the use of hay bales and other control devices.

Note: The Developer/Contractor's attention is directed to the fact that a permit from the Division of Water Resources might be required for aquatic resource alteration for work in and/or around streams.

SECTION 4 - TESTING

4.1 GENERAL

Testing and inspection of the completed work shall be accomplished by the following methods:

1. Visual Inspection
2. Infiltration Testing (Leakage Tests)
3. Air Pressure Testing of Lines
4. Roundness Testing
5. Vacuum Testing of Manholes

Upon completion of construction, the Contractor shall remove all sand, dirt, brick and other foreign materials from the sewers and shall conduct his own inspection to locate any defects and determine when the sewers are ready for testing and final inspection by the Engineer and the Sewer Department. All apparent defects shall be corrected by the Contractor before testing or final inspection are requested.

No sewer line shall be allowed to discharge into the existing sewage system until said line is free of foreign materials and obvious defects have been corrected. New lines, then, must remain disconnected from the existing system by actual physical separation, by plugs of type approved by the Sewer Department, or by other means approved by the Sewer Department.

Testing of the system before final inspection by the Sewer Department shall consist of visual observation and leakage tests conducted by the Engineer and observed by the Sewer Department. The Sewer Department will not conduct a final inspection until receiving written notification from the Engineer that the construction is complete in accordance with approved drawings and specifications. This notification shall include a report of the results of the visual observation and leakage tests.

4.2 VISUAL INSPECTION AND INTERNAL TELEVISION INSPECTIONS

The Engineer will make the necessary visual inspections to verify the quality of workmanship. Such inspections shall include examination of manholes, "lamping" or "flashing" sewer lines and observation of clean-up and pavement replacement.

Any defects such as misalignment of sewers, visible leaks, obstructions, cracked or broken pipe, or failure to restore the surface to a satisfactory condition must be corrected before acceptance.

The Contractor/Developer shall perform internal television inspections of all gravity sewer lines. The Contractor/Developer shall provide City of Mt. Juliet with DVD and Logs of internal television of sewer lines.

4.3 LEAKAGE TESTS

In addition to the visual inspections, leakage tests may be made to ensure compliance with the infiltration limitations. Infiltration shall not exceed 25 gallons per day per inch diameter per mile of sewer. However, in view of the fact that the ground water table fluctuates and likely will not be at a maximum when the test needs to be made, tests may be based on exfiltration with a head of one foot above the invert at the upstream manhole.

- (e) Observe safety precautions during test. Caution all workers to remain clear of test plugs which can blow out under considerable force at any time the line is pressurized.

Tests shall be made upon completion of the sewer after visual inspection but before any service connections have been made. The Developer, through his Contractor or Engineer, shall furnish all labor, tools, equipment and materials for the tests. The tests must be scheduled at a time acceptable to the Sewer Department and shall be witnessed by the Engineer's representative.

4.5 ROUNDNESS TEST

Sewer constructed of PVC pipe shall pass a go/no-go mandrel sized to 95% of the actual pipe diameter with the pipe in place and backfill completed.

Contractor shall provide a suitable ball or mandrel having a diameter equal to 95% of the actual inside pipe while the Owner or his authorized representative observes the test. Any section of sewer showing a deflection of more than 5% of the actual inside diameter shall be considered to have failed and shall be re-laid to correct the condition. Mandrel shall be pulled without mechanical pulling devices and shall not be performed until a minimum of 7 days after backfilling operations.

4.6 VACUUM TESTING OF MANHOLES

Before testing, all pipes and other openings into the manhole shall be suitably plugged in such a manner as to prevent displacement of the plugs while the vacuum is pulled. Installation and operation of the vacuum equipment and indicating devices shall be in accordance with equipment specifications and instructions provided by the manufacturer. The test head shall be placed in the cone section of the manhole.

Before final acceptance, all manholes shall be vacuum tested to at least 10" Hg. The test shall be considered acceptable when the vacuum remains at 10" Hg. or drops to no less than 9" Hg. within the time period specified below.

Acceptance for 4-foot diameter manholes shall be defined as when the time to drop to 9 inches of mercury meets or exceeds the following:

| <u>MANHOLE DEPTH</u> | <u>DIAMETER</u> | <u>TIME TO DROP 1" HG</u> |
|----------------------|-----------------|---------------------------|
| 4 feet to 10 feet | 4 feet | 75 seconds |
| 10 feet to 15 feet | 4 feet | 90 seconds |
| 15 feet to 25 feet | 4 feet | 105 seconds |

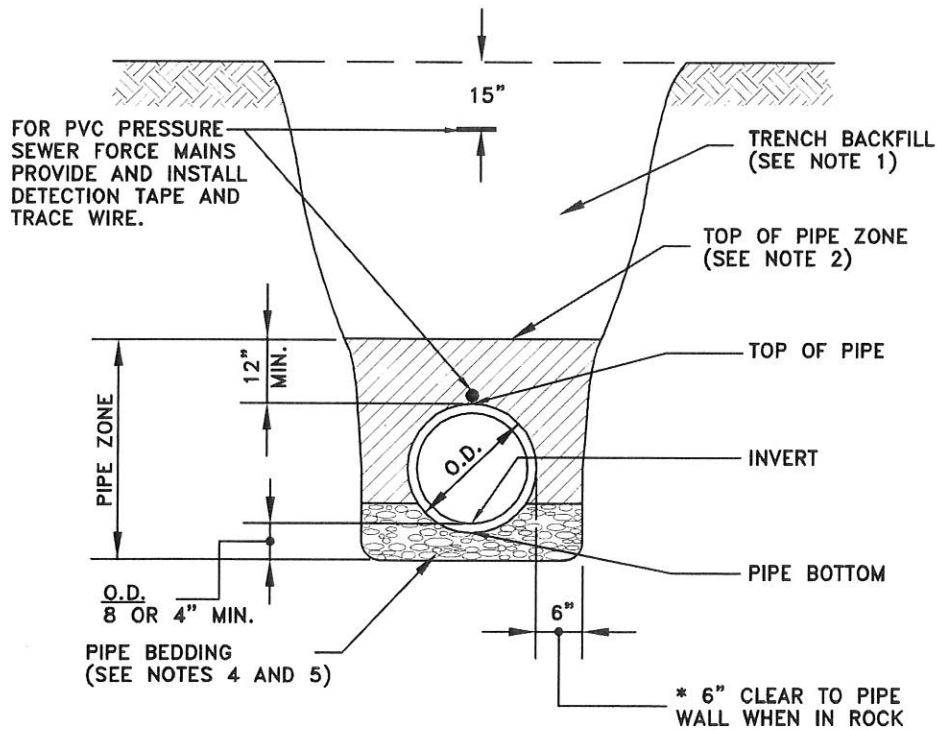
For manholes 5 feet in diameter, add an additional 15 seconds and for manholes 6 feet in diameter, add an additional 30 seconds to the time requirements for 4-foot diameter manholes. If the manhole fails the test, necessary repairs shall be made and the vacuum test repeated until the manhole passes the test. If the manhole joint mastic or gasket is displaced during the vacuum test, the manhole shall be disassembled, the seal replaced, and the manhole retested.

The Developer, through his Contractor or Engineer, shall furnish all labor, tools, equipment, materials, apparatus, gauges, etc. for the tests.

STANDARD DETAIL DRAWINGS

NOTES:

1. SEE PROJECT SPECIFICATIONS FOR BACKFILL REQUIREMENTS.
2. "PIPE ZONE" EXTENDS TO 12" ABOVE TOP OF PIPE AND BACKFILL IN TO BE CRUSHED STONE, GRAVEL OR OTHER GRANULAR MATERIAL AS APPROVED BY THE ENGINEER.
3. LIMIT TRENCH WIDTH AT TOP OF PIPE ZONE TO O.D. + 16", UNLESS PERMITTED OTHERWISE BY ENGINEER.
4. PIPE BEDDING IS TO BE CRUSHED GRAVEL OR OTHER GRANULAR MATERIAL AS APPROVED BY ENGINEER. DEPTH UNDER BOTTOM OF PIPE IS TO BE $1/8$ OUTER DIAMETER (O.D.) OF PIPE OR 4", WHICHEVER IS GREATER.*
5. PIPE TO BE CONTINUOUSLY SUPPORTED ALONG LENGTH OF PIPE BARREL EXCEPT AT BELLS. BELL HOLES ARE REQUIRED SUCH THAT NO BEARING LOAD IS TAKEN BY THE BELL.

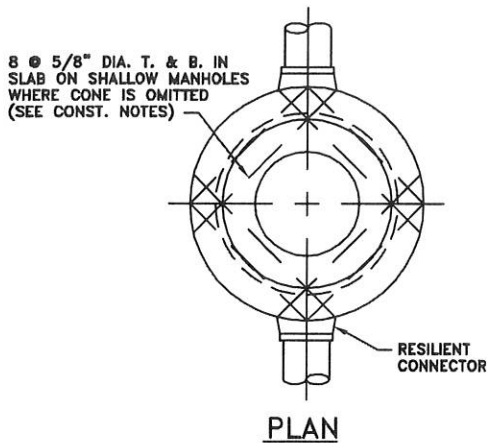


TYPICAL SEWER INSTALLATION

NOT TO SCALE

WMS# 13108

NOTE: ALL MANHOLES SHALL BE MANUFACTURED WITH XYPEX ADMIX C-1000/C-2000 IN CONCRETE FOR WATERPROOFING AND PROTECTION AGAINST HYDROGEN SULFIDE DETERIORATION. XYPEX ADMIX SHALL BE AS SUPPLIED BY TOM WILLIAMS; 1231 ANTOICH PIKE, NASHVILLE. PRECAST MANHOLES SHALL BE AS SUPPLIED BY CLOUD CONCRETE PRODUCTS OR ENGINEER APPROVED EQUAL.

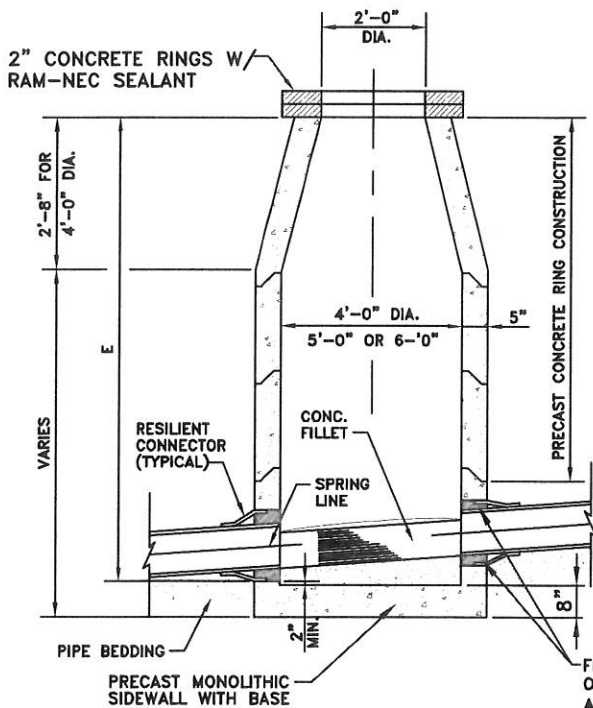


CONSTRUCTION NOTES

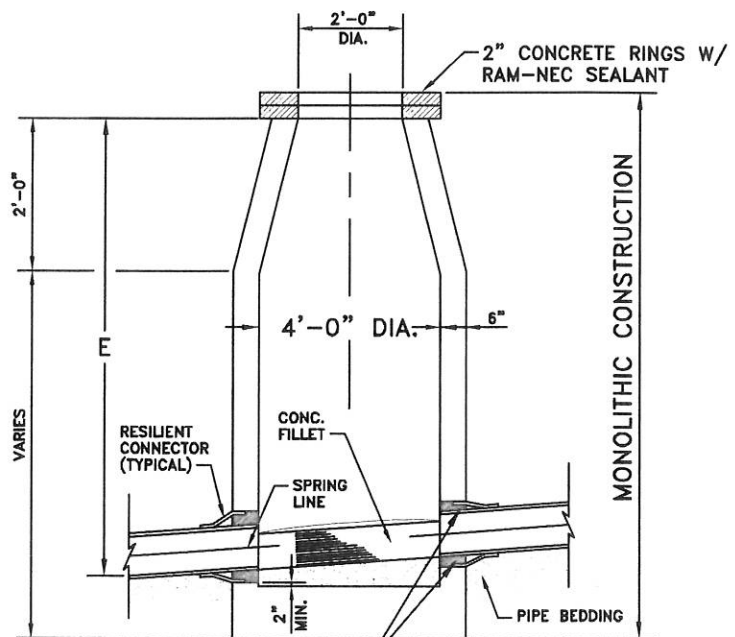
CYLINDRICAL AND CONICAL SECTIONS OF ALL MANHOLES SHALL BE CONSTRUCTED OF EITHER MONOLITHIC CONCRETE OR PRECAST CONCRETE RINGS AS DESIGNED IN THE PROJECT SPECIFICATIONS OF THE CONTRACT DOCUMENT. CONCENTRIC CONES SHALL BE USED ON PRECAST CONCRETE AND MONOLITHIC CONCRETE UNITS.

DIMENSION "E" VARIES. WHEN LESS THAN 5- FEET OMIT CONE AND EXTEND CYLINDRICAL MANHOLE SIDEWALL SECTION TO AN ELEVATION 8-INCHES BELOW BOTTOM OF ADJUSTING BRICK. CONSTRUCT 8-INCH THICK CONCRETE SLAB ON TOP OF CYLINDRICAL SECTION REINFORCED WITH 5/8-INCH DIA. BARS AS SHOWN. PROVIDE 24-INCH DIAMETER OPENING IN SLAB FOR MANHOLE'S FRAME AND BRICK ADJUSTMENT RINGS AS ON CONED MANHOLE. BENCH WALLS IN MANHOLES FOR SEWERS 18-INCHES IN DIAMETER AND SMALLER TO BE BUILT UP TO THE THREE-QUARTER POINT ON PIPE. SEWERS 21-INCHES TO 30-INCHES IN DIAMETER - 15-INCHES HIGH. LARGER SEWERS TO SPRING LINE. NO BENCH WALLS REQUIRED IN DEAD END MANHOLES, ALTHOUGH BOTTOM TO BE PROPERLY DISHED.

NOTE: GRANULAR BACKFILL MATERIAL SHALL BE PLACED ADJACENT TO MANHOLE IN AREAS WHERE SWELLING CLAY EXIST.



SECTION

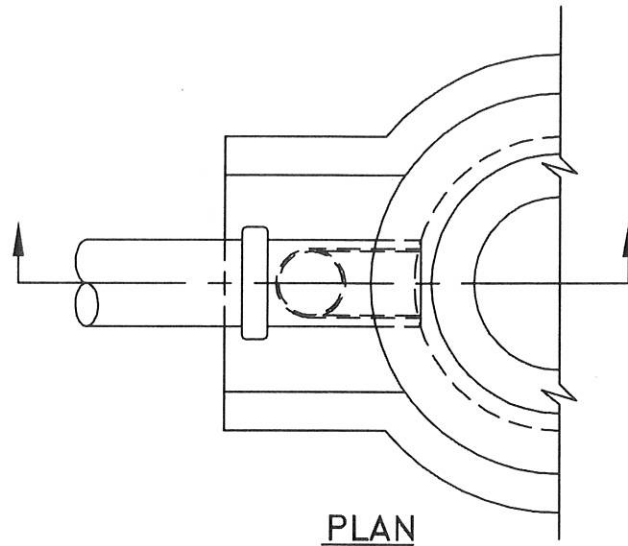


FILL ANNULAR SPACE WITH RAM-NEX SEALANT OR INSTALL FLEXIBLE ANNULAR SPACE FILLER AROUND PIPES WITH "CAVITY-O-RING" AS MANUFACTURED BY N.P.C. SYSTEMS, INC. OF MILFORD, NEW HAMPSHIRE, OR APPROVED EQUAL. NO CONCRETE OR GROUT FILL ALLOWED.

FOR SEWERS
36" DIAMETER & SMALLER
NOT TO SCALE

POURED IN PLACE MANHOLE
NOT TO SCALE

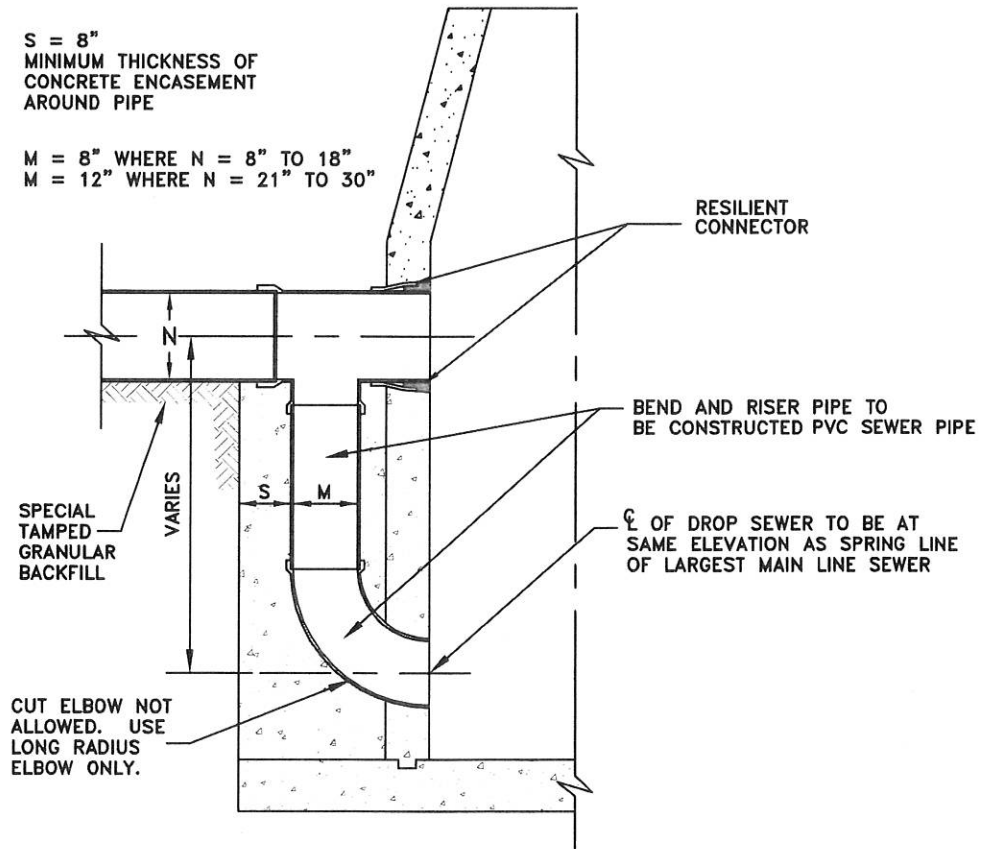
STANDARD MANHOLES NOT TO SCALE



PLAN

S = 8"
MINIMUM THICKNESS OF
CONCRETE ENCASEMENT
AROUND PIPE

M = 8" WHERE N = 8" TO 18"
M = 12" WHERE N = 21" TO 30"

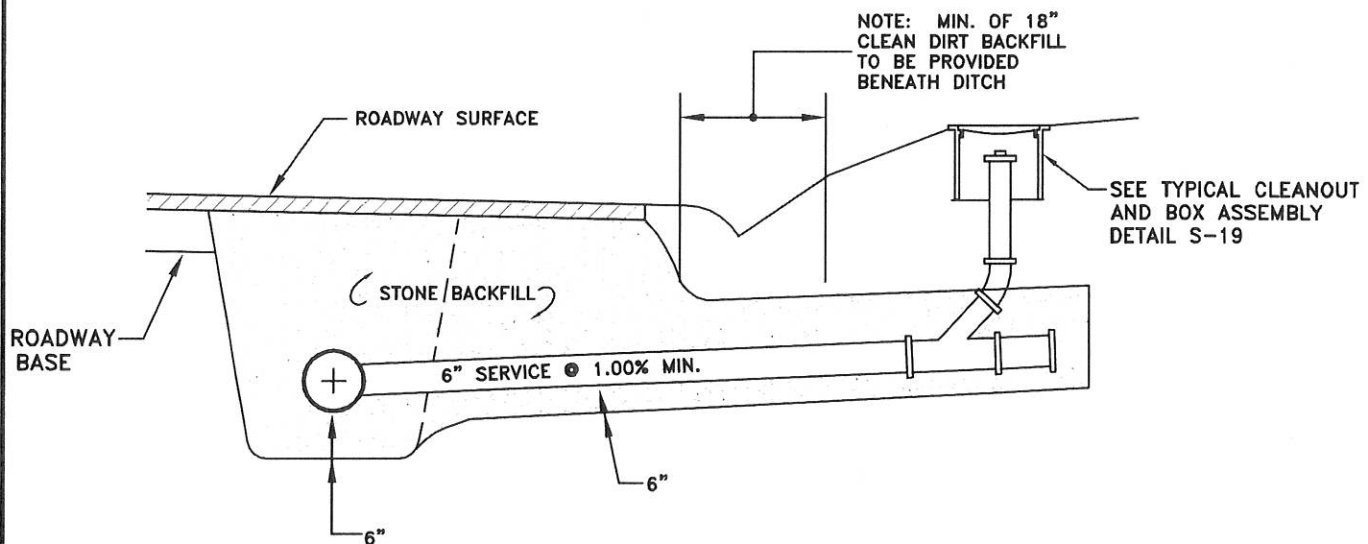
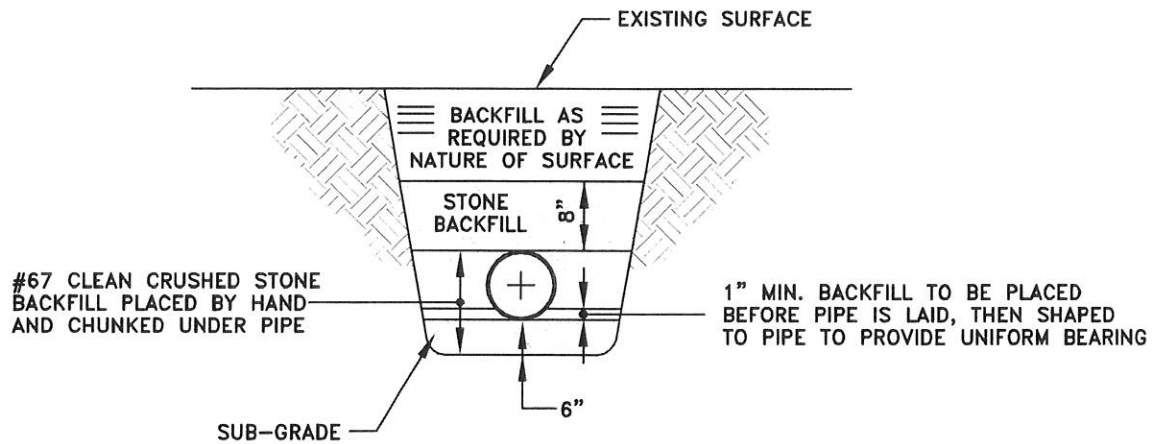


SECTION

DROP PIPE
FOR STANDARD MANHOLES

NOT TO SCALE

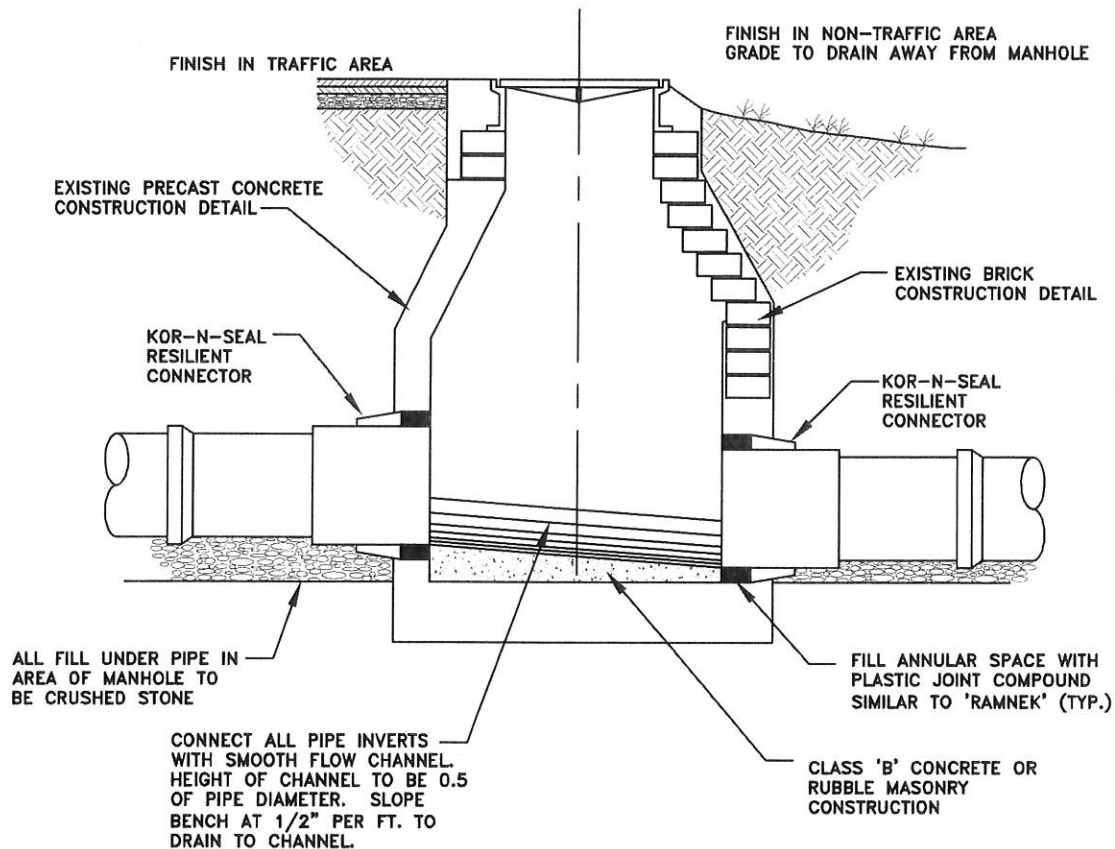
WMS# 13108



SERVICE LINE

NOT TO SCALE

WMS# 13108



NOTE: THE CONTRACTOR SHALL NOT CONNECT TO EXISTING MANHOLE UNTIL ALL NEW SEWAGE FACILITIES HAVE BEEN INSTALLED, TESTED AND RELEASED FOR SERVICE.

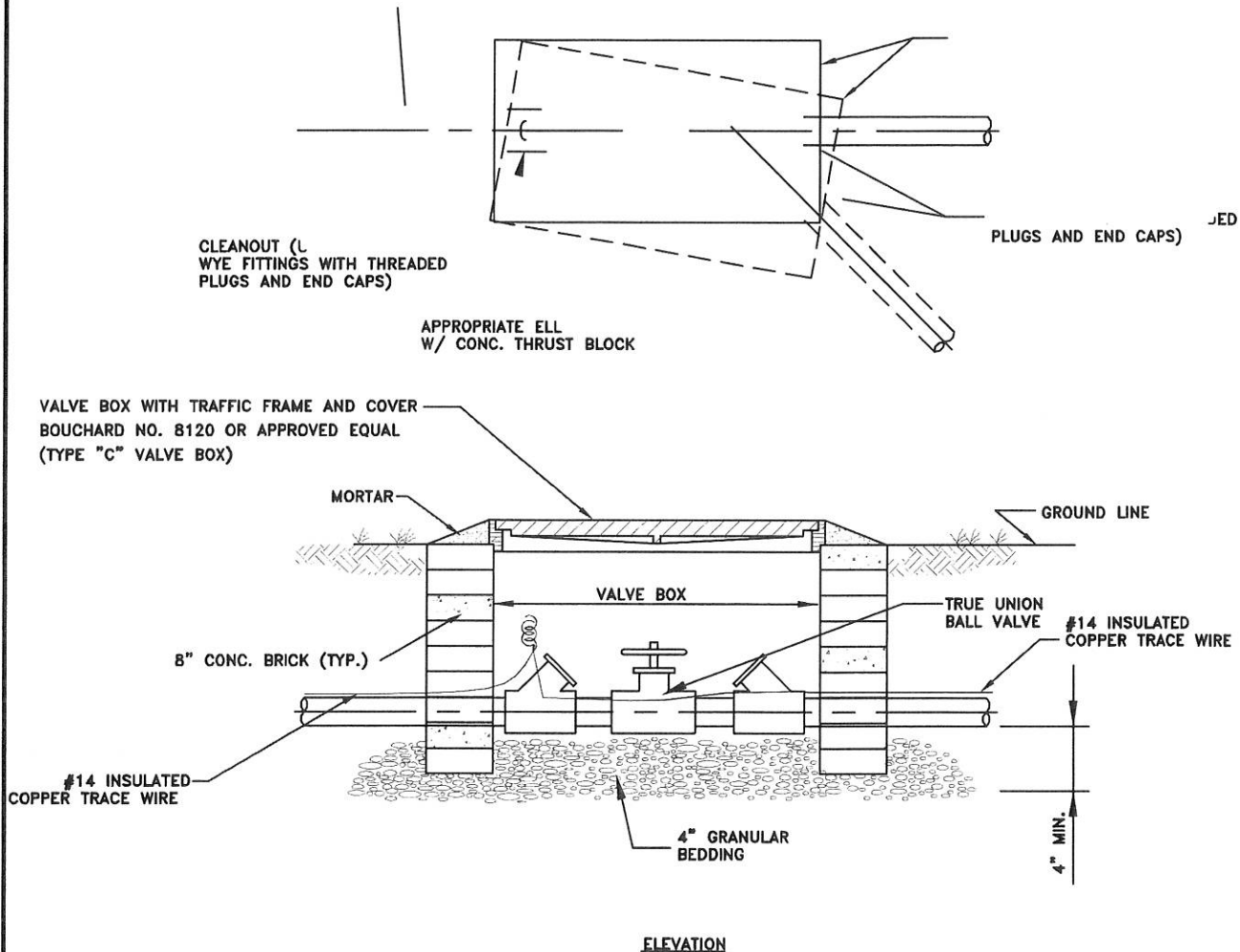
CONNECTION TO EXISTING MANHOLE

NOT TO SCALE

WMS# 13108

NOTE:

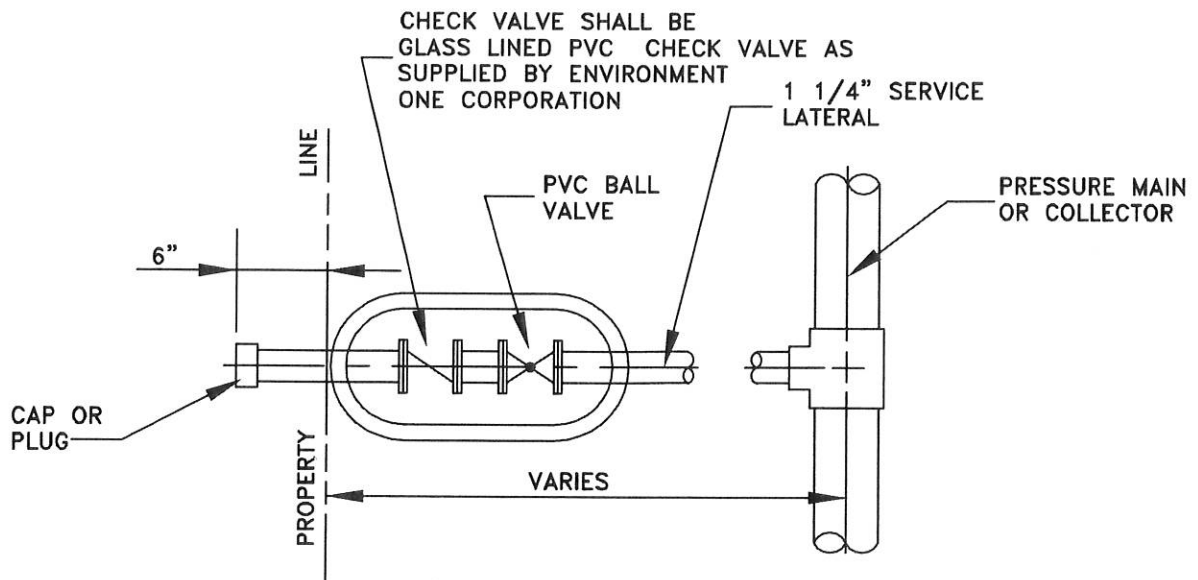
PROVIDE FOR ENTRANCE AND EXIT
OF PRESSURE SEWER THROUGH WALLS
OF VALVE BOX AT ANGLES REQUIRED
BY CHANGE OF DIRECTION IF ANY.



TYPICAL VALVE BOX & CLEANOUT ARRANGEMENT
ALONG STRAIGHT RUNS & AT CHANGES IN DIRECTION

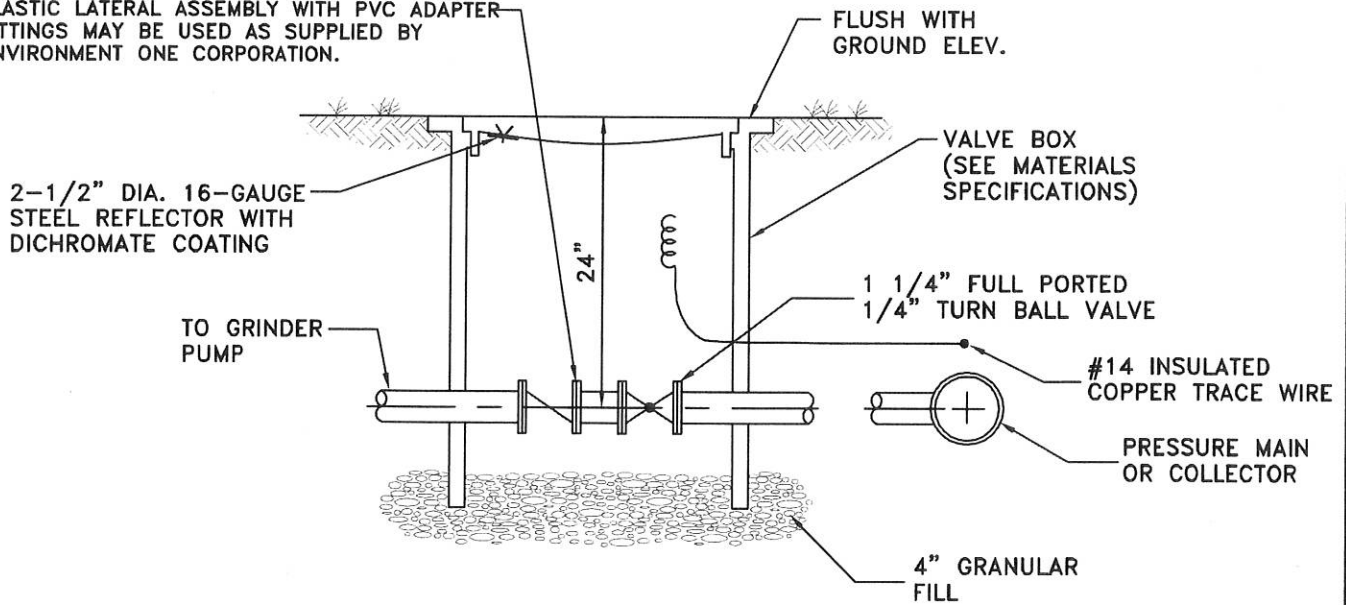
NOT TO SCALE

WMS# 13108



NOTE:

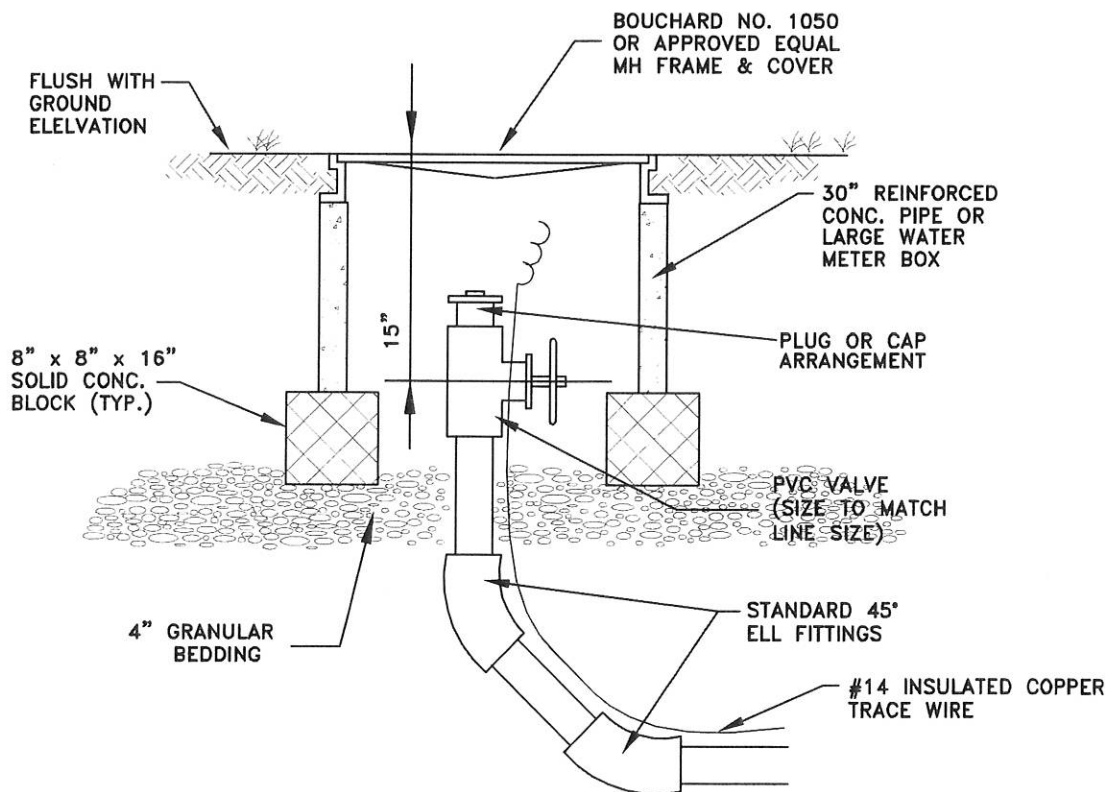
1. AT CONTRACTOR'S OPTION A 1 1/4" PLASTIC LATERAL ASSEMBLY WITH PVC ADAPTER FITTINGS MAY BE USED AS SUPPLIED BY ENVIRONMENT ONE CORPORATION.



TYPICAL SERVICE LINE CONNECTION (1 1/4")

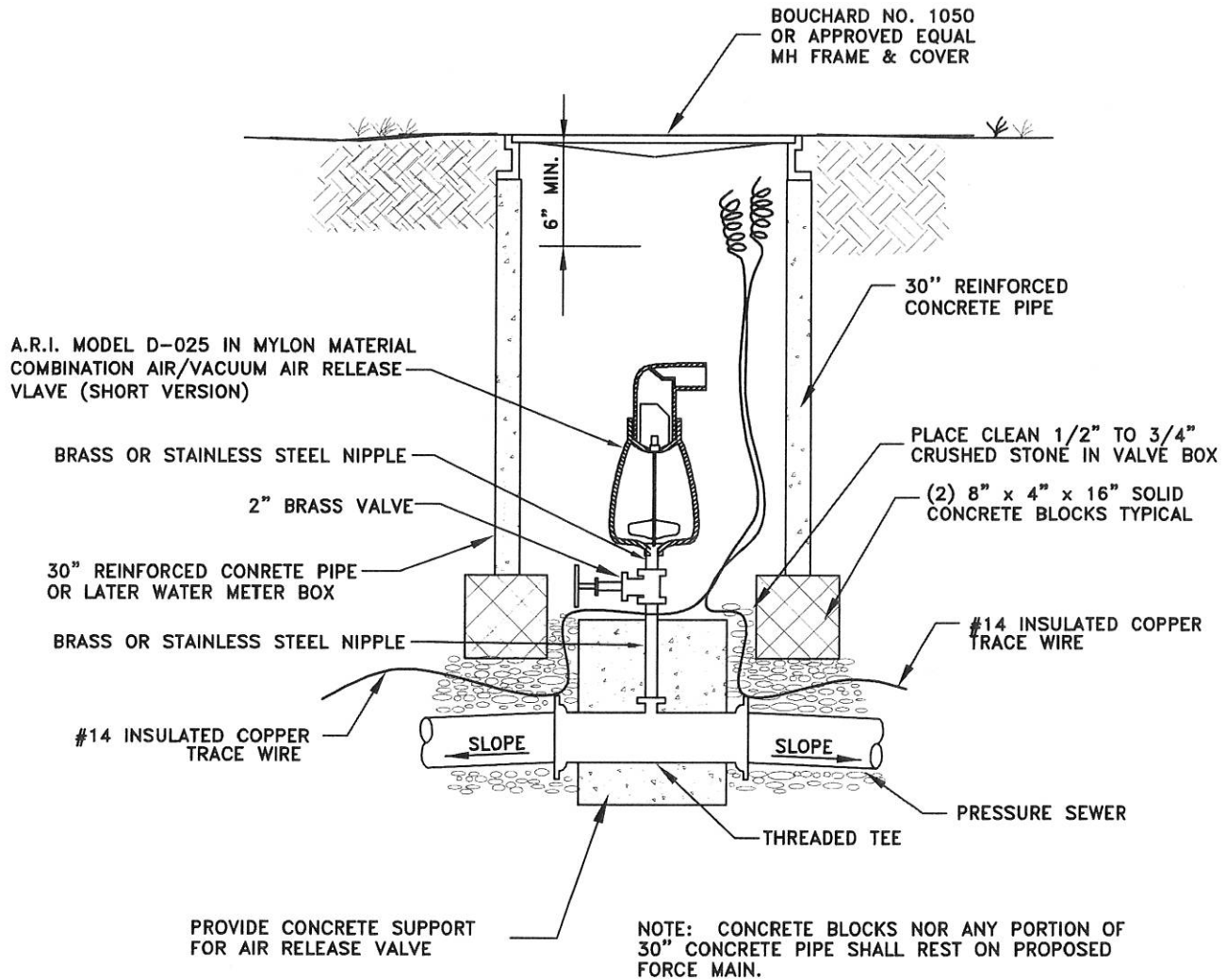
NOT TO SCALE

WMS# 13108



TERMINAL VALVE BOX AND CLEANOUT ASSEMBLY
AT END OF PRESSURE SEWER
 NOT TO SCALE

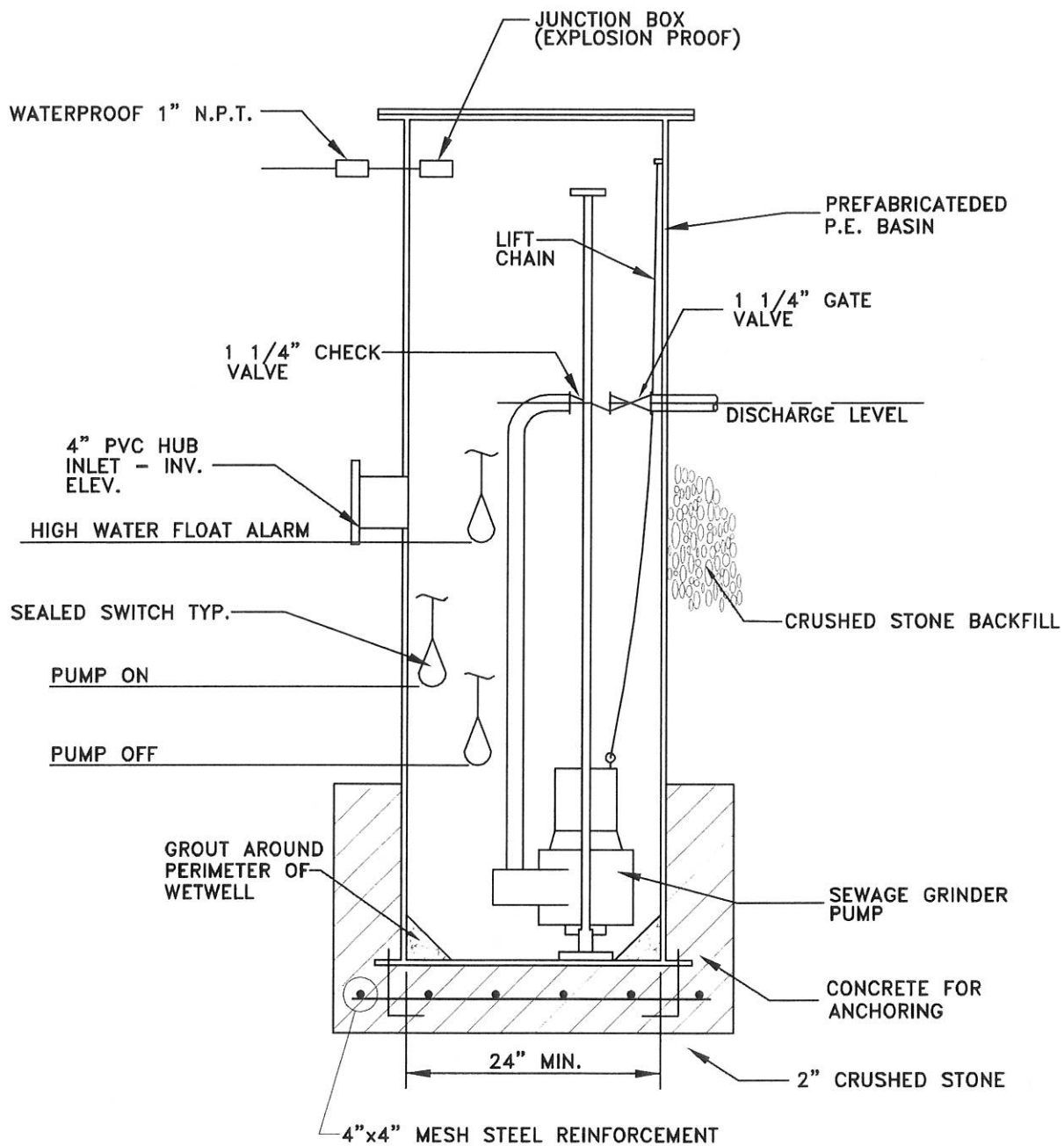
WMS# 13108



AUTOMATIC AIR RELEASE MANHOLE

NOT TO SCALE

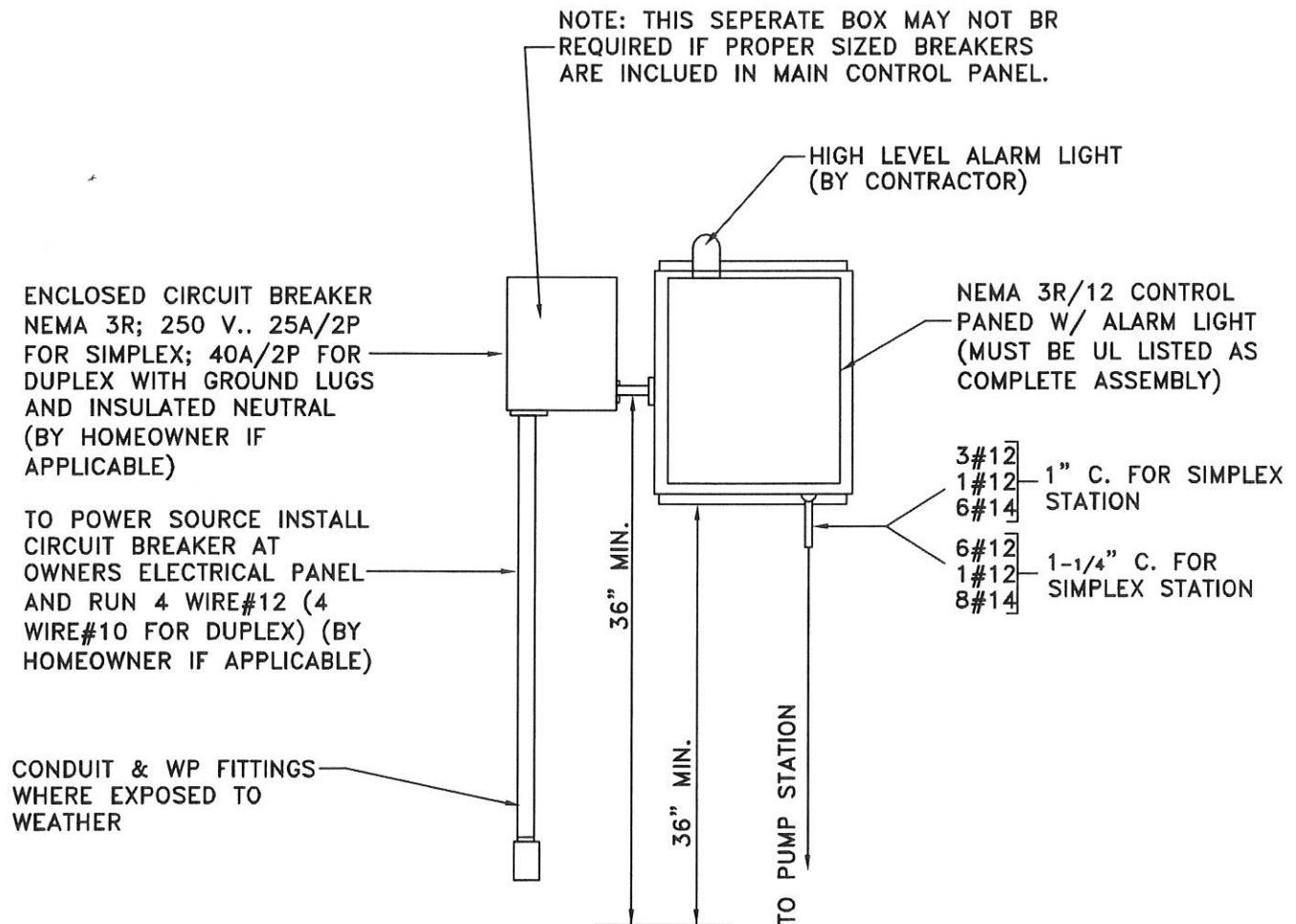
WMS# 13108



TYPICAL GRINDER PUMP ARRANGEMENT

NOT TO SCALE

WMS# 13108



ELECTRICAL NOTES:

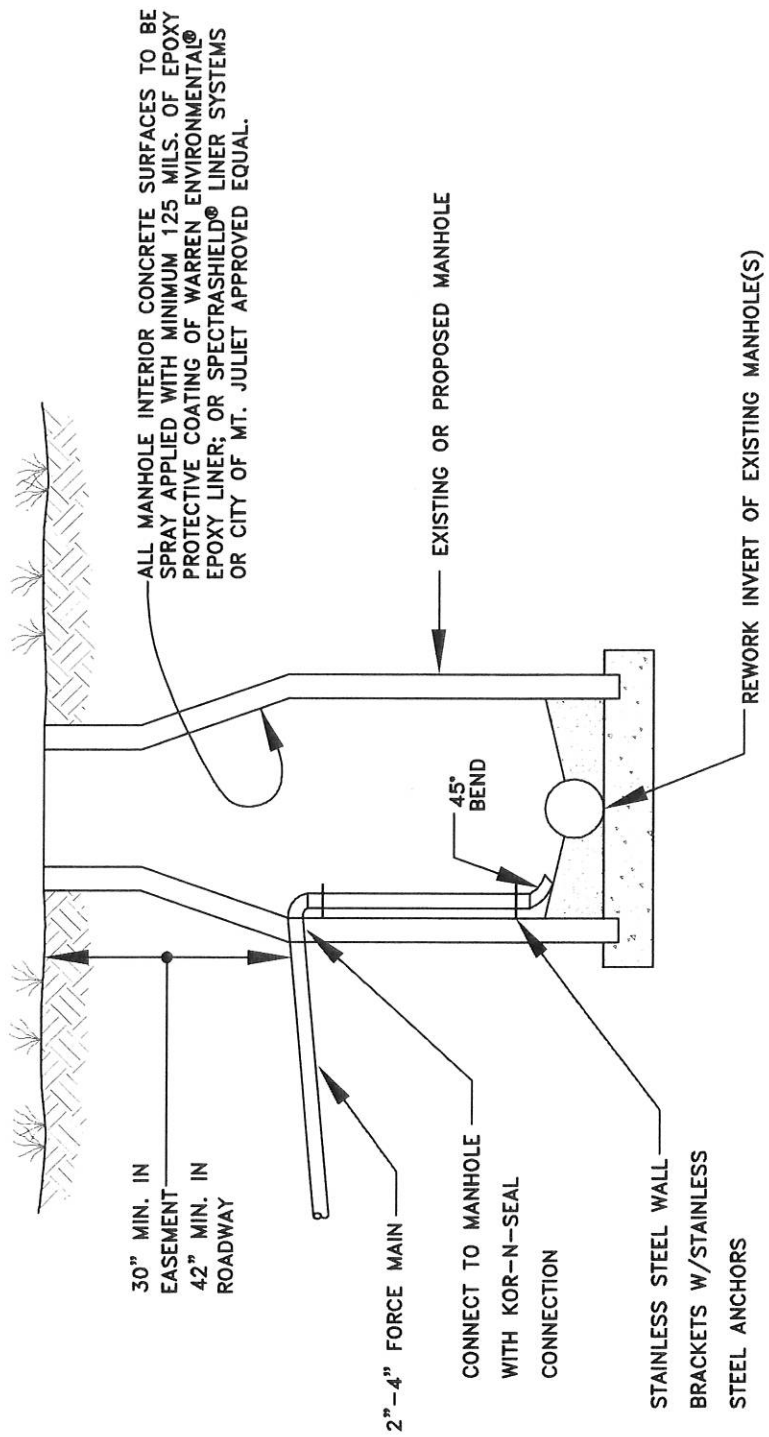
1. WIRE: COPPER- THW, OR THWN.
2. CONDUIT: RIGID GALVANIZED STEEL.
3. CODES: NEC OR LOCAL AUTHORITY

NOTE: DUPLEX STATIONS TO BE SIMILAR EXCEPT FOR BASIN TO
BE 36" DIAMETER WITH TWO PUMPS AND RELATED EQUIPMENT.

TYPICAL CONTROL PANEL DETAIL

NOT TO SCALE

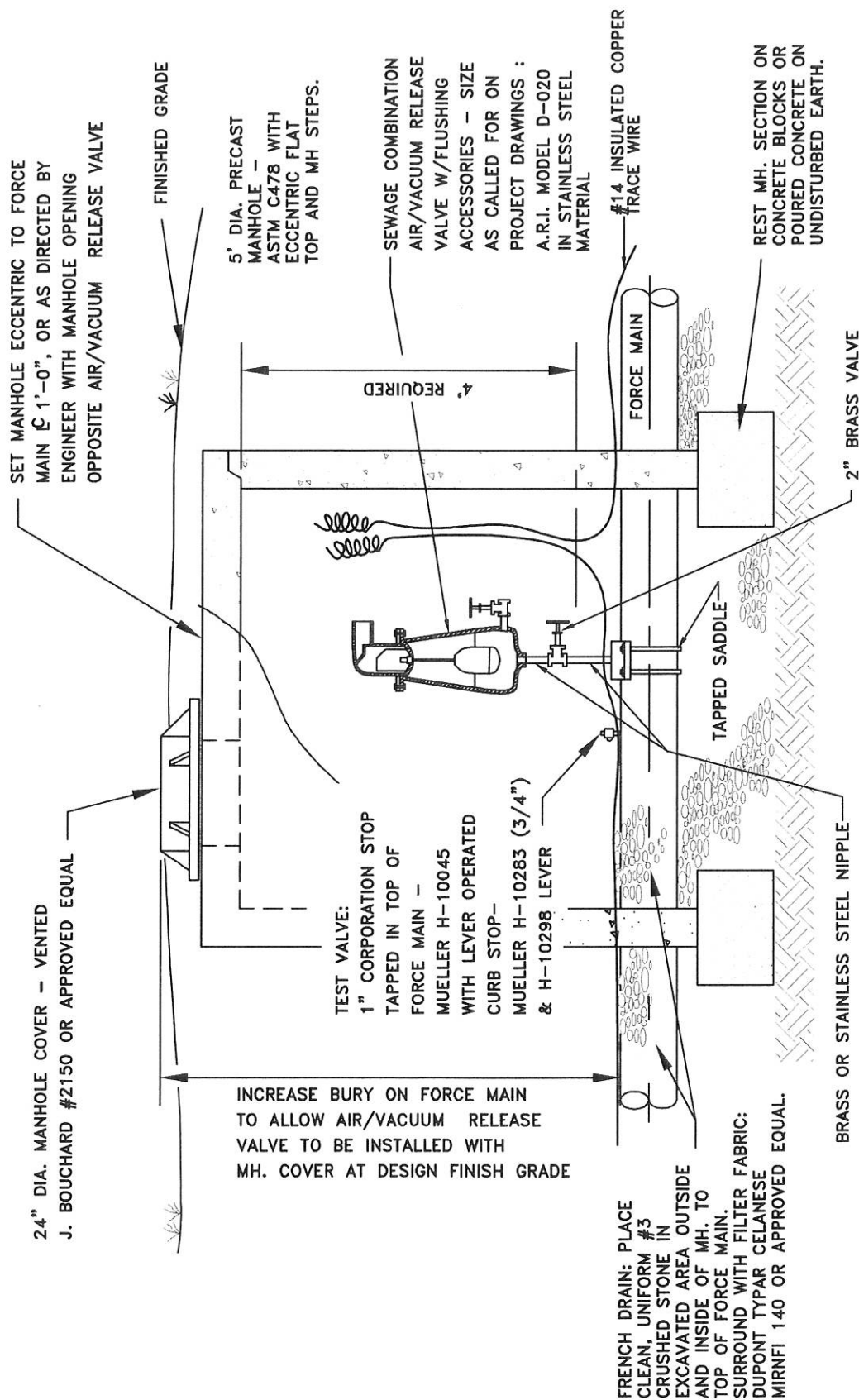
WMS# 13108



FORCE MAIN TIE-IN AT MANHOLE (TYP.)

NOT TO SCALE

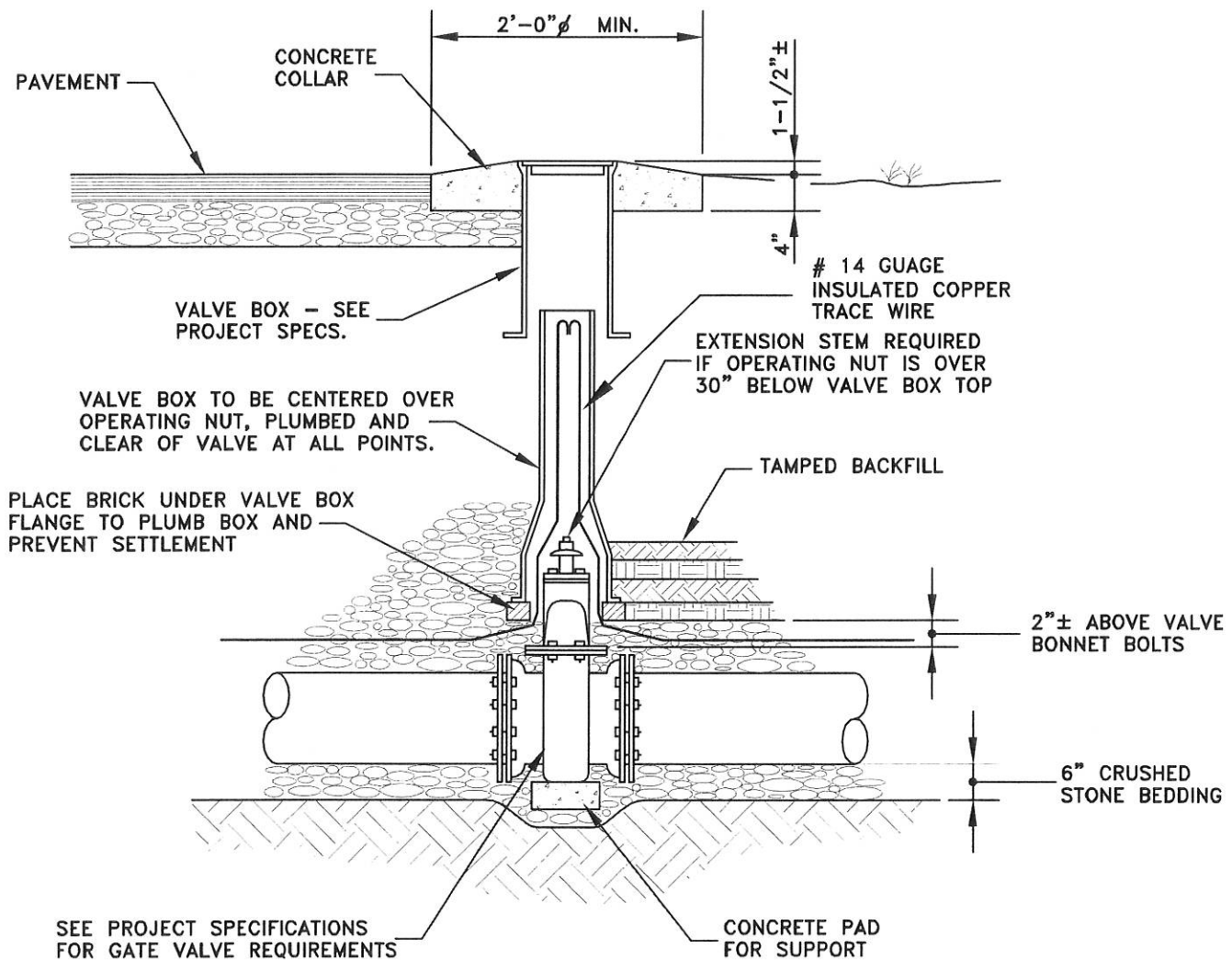
WMS# 13108



AUTOMATIC COMBINATION AIR & VACUUM RELEASE MANHOLE

NOT TO SCALE

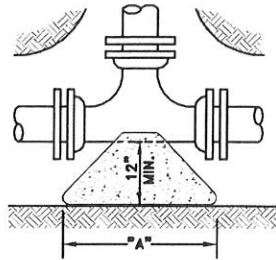
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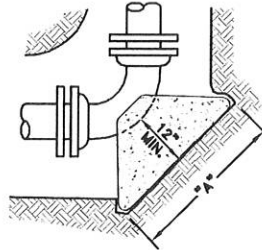
TYPICAL GATE VALVE INSTALLATION

NOT TO SCALE

WMS# 13108



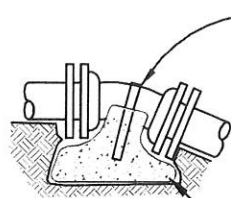
PLAN: TEE



PLAN: 90° BEND

NOTES:

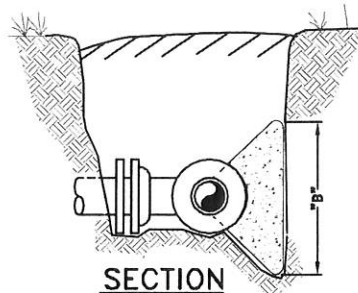
1. CONCRETE TO BE CLASS "B" (2000 P.S.I.) OR STRONGER.
2. DIMENSIONS AS SHOWN ARE APPROXIMATE - SUBJECT TO CHANGE AT DIRECTION OF OR APPROVAL OF ENGINEER.
3. KEEP CONCRETE CLEAR OF ANY PIPE JOINT, GLAND BOLTS, ETC.
4. CONCRETE TO BEAR AGAINST UNDISTURBED EARTH WITH BEARING AREA EQUIVALENT TO AT LEAST AxB.



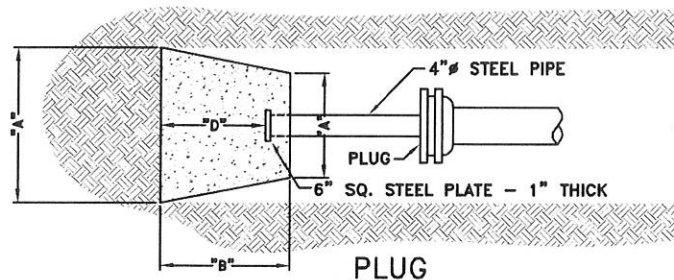
GRAVITY-TYPE
THRUST BLOCK

FOR UPPER THRUST BLOCK ON A VERTICAL BEND, CONCRETE VOLUME SHALL BE AS DETERMINED BY ENGINEER. LOWER BLOCK TO HAVE DIMENSIONS ACCORDING TO SCHEDULE BELOW. FITTING TO BE FIXED TO UPPER BLOCK USING 1/4" x 2" STEEL STRAP PROTECTED WITH 2 COATS BITUMASTIC PAINT (OR AS OTHERWISE APPROVED BY ENGINEER).

WEIGHT IS CRITICAL - MUST BE DETERMINED OR APPROVED BY ENGINEER.



SECTION



PLUG

SCHEDULE OF MINIMUM BEARING AREA REQUIRED

BASED ON 200 PSI INTERNAL PRESSURE AND
4000 PSF SOIL BEARING CAPACITY*

| PIPE SIZE | TEE OR DEAD END | 90° BEND | 45° BEND | 22 1/2° BEND | 11 1/4° BEND |
|-----------|-----------------|----------|----------|--------------|--------------|
| 4" | 1.0 | 1.5 | 1.0 | 1.0 | 1.0 |
| 6" | 2.5 | 3.0 | 2.0 | 1.0 | 1.0 |
| 8" | 4.0 | 5.5 | 3.0 | 1.5 | 1.0 |
| 10" | 6.0 | 8.5 | 4.5 | 2.5 | 1.5 |
| 12" | 8.5 | 12.0 | 6.5 | 3.0 | 2.0 |
| 16" | 15.0 | 21.5 | 11.5 | 6.0 | 3.0 |
| 18" | 20.0 | 27.5 | 15.0 | 8.0 | 4.0 |
| 20" | 24.0 | 33.5 | 18.5 | 9.5 | 5.0 |
| 24" | 34.0 | 48.0 | 26.0 | 13.5 | 7.0 |
| 30" | 53.0 | 76.5 | 41.0 | 21.5 | 12.0 |
| 36" | 76.5 | 110.0 | 59.0 | 30.5 | 17.5 |

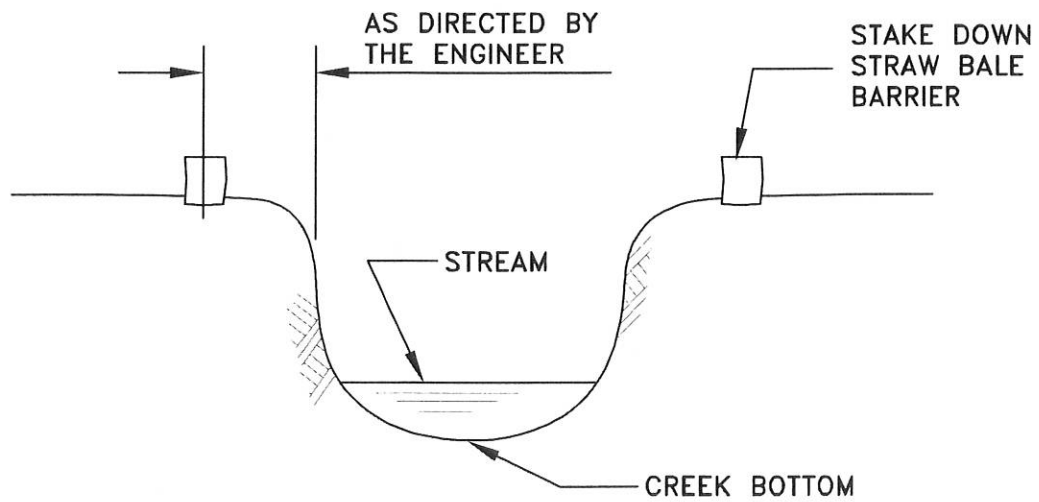
VALUES ARE TABULATED IN SQUARE FEET

*Engineer to confirm actual required dimensions before construction of the Thrust Block.
Bearing Area (square feet) = A(feet) x B(feet)

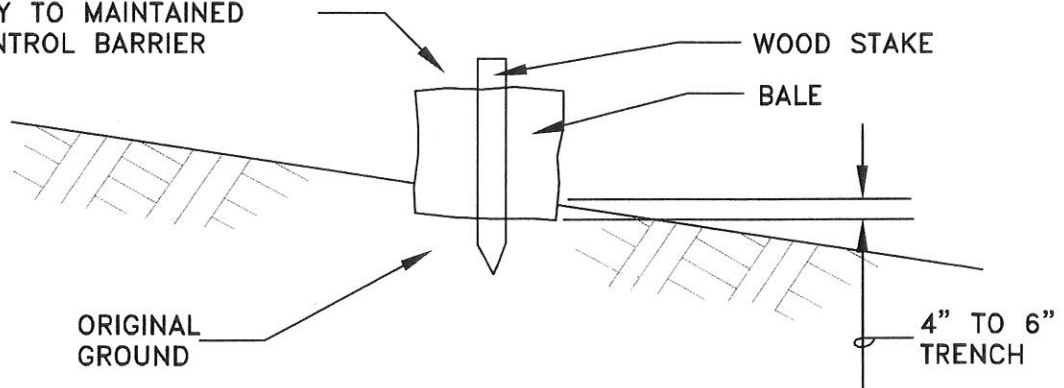
CONCRETE THRUST BLOCK DETAILS

FOR BOTH WATER AND FORCE MAINS

WMS# 13108



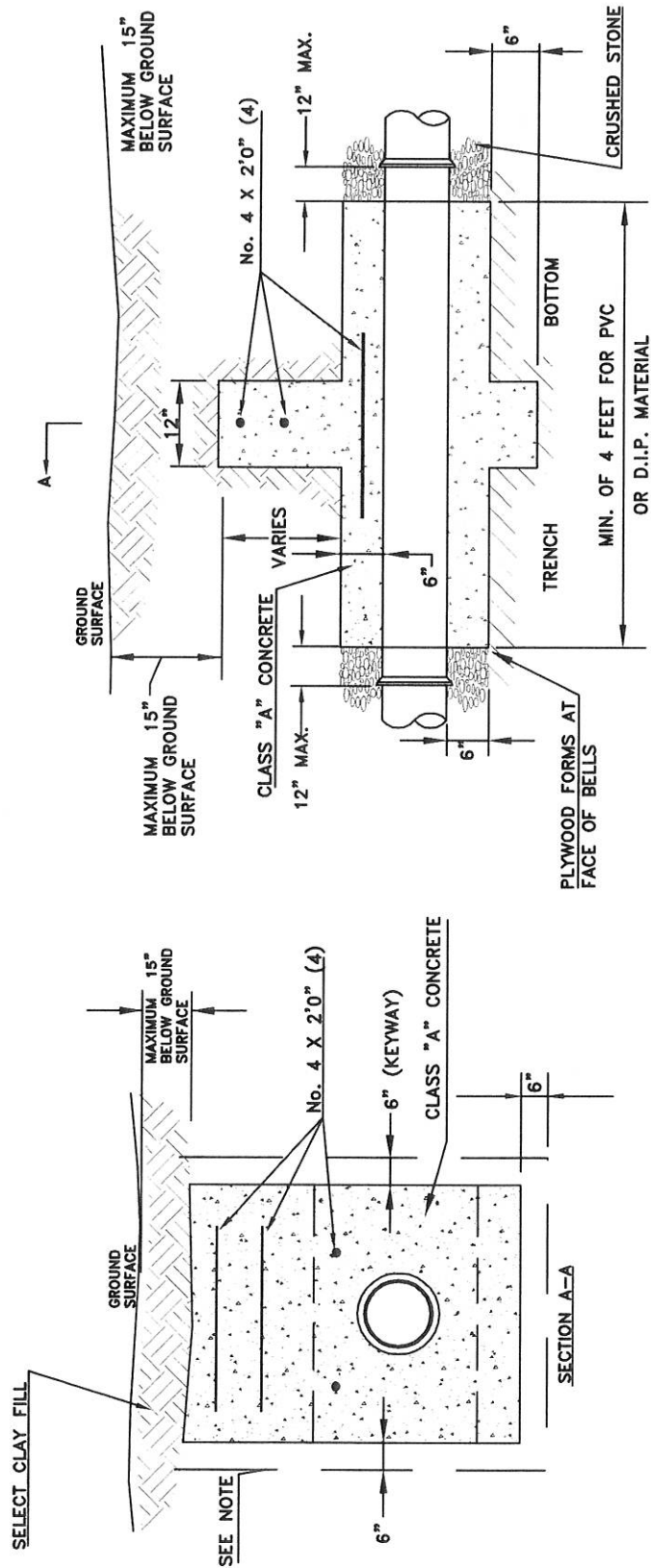
PLACE AND MAINTAINED CONTINUOUSLY
AS NECESSARY TO MAINTAINED
SEDIMENT CONTROL BARRIER



STRAWBALE SEDIMENT CONTROL BARRIER DETAIL

SCALE: NONE

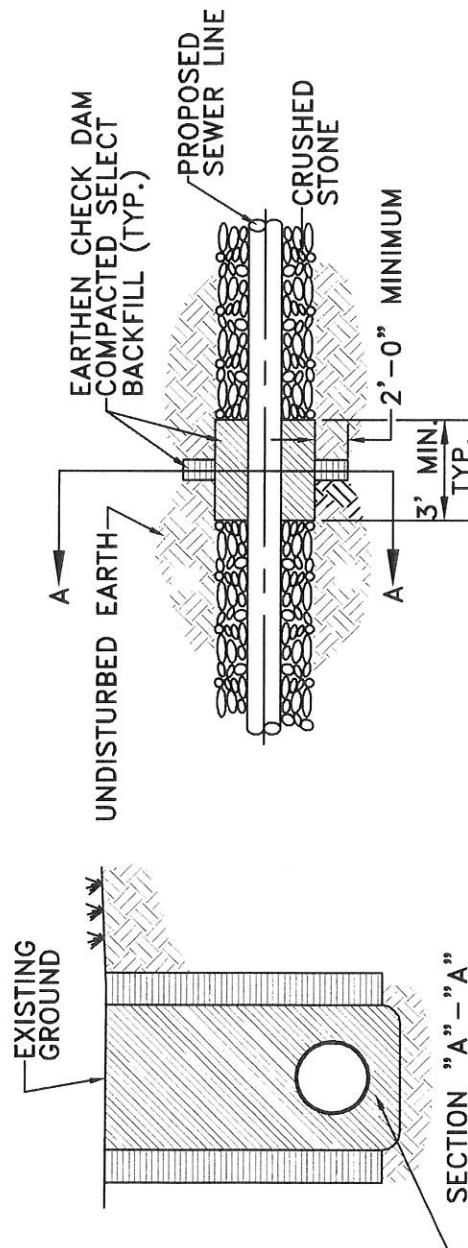
WMS# 13108



NOTE: A 6-INCH KEYWAY SHALL BE CUT IN DIRT EXCAVATION. FRACTURED AND SHOT ROCK SHALL BE REMOVED TO CLEAN SOLID ROCK IN ROCK TRENCHES. THIS IS REQUIRED ON SIDES IN ADDITION TO BOTTOM. IF BOTTOM IS OVER SHOT IT MUST BE CLEANED TO SOLID UNFRACTURED ROCK.

CONCRETE CHECK DAM

NOT TO SCALE



SPECIAL CARE MUST BE USED TO PLACE AND COMPACT CLAY SOIL UNDER THE HAUNCHES OF THE PIPE TO PROVIDE UNIFORM SUPPORT UNDER THE PIPE.

IN AREAS DESIGNATED FOR "EARTHEN CHECK DAM", BEDDING & BACKFILL WITHIN THE PIPE ZONE AND FOR A DISTANCE OF 3 FEET ALONG THE PIPE CENTERLINE SHALL BE SELECTED CLAY SOIL PLACED IN LIFTS OF 6 INCHES± AND COMPACTED TO AT LEAST 80% MINIMUM DENSITY (STANDARD PROCTOR)

EARTHEN CHECK DAM

NOT TO SCALE

WMS# 13108

STANDARD FRAME AND COVER
BOUCHARD NO. 8006; SEE SPECS

GROUND LEVEL

FINISH IN TRAFFIC AREA

STANDARD CONCRETE BOX
AS DETAILED IN SPECS
INSIDE DIMENSIONS
(11" x 13 1/4")
OUTSIDE DIMENSIONS
(17" x 19 1/4")
APPROX. HEIGHT 12" - 15"

6" PLUG & CAP
ARRANGEMENT

SOLID PRECAST
CONCRETE
BLOCKS TYPICAL
(12" x 12" x 4")

GRANULAR MATERIAL
6" MIN. DEPTH

45° BEND

6" PVC OR DIP
SEWER SERVICE

STANDARD CLEANOUT WYE

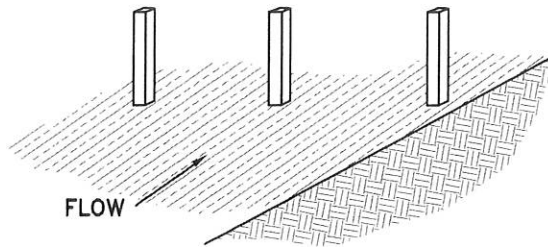
* FOR TYPICAL TERMINAL CLEANOUT
SEE DETAIL S26 OR S27

TYPICAL IN-LINE* CLEANOUT ASSEMBLY

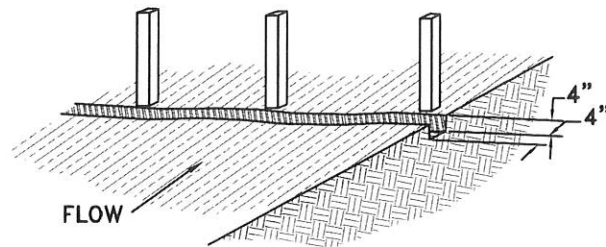
NOT TO SCALE

WMS# 13108

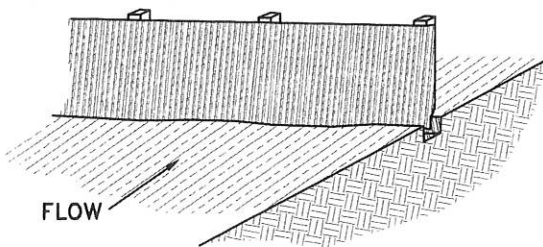
1. SET THE STAKES.



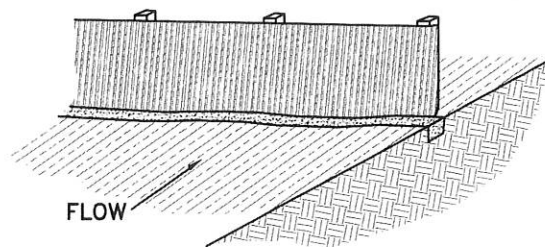
2. EXCAVATE A 4"x4" TRENCH UPSLOPE ALONG THE LINE OF STAKES.



3. STAPLE FILTER MATERIAL TO STAKES AND EXTEND IT INTO THE TRENCH.



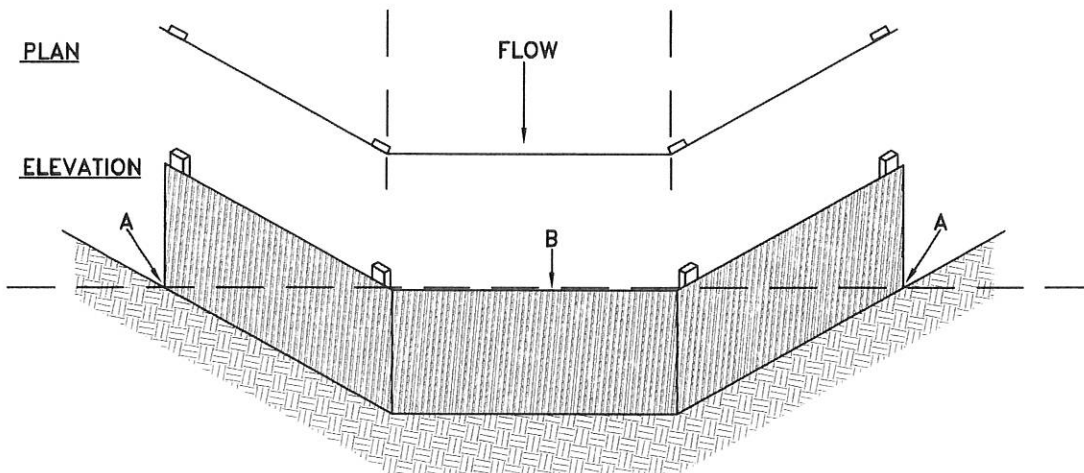
4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



CONSTRUCTION OF A FILTER BARRIER

PLAN

ELEVATION



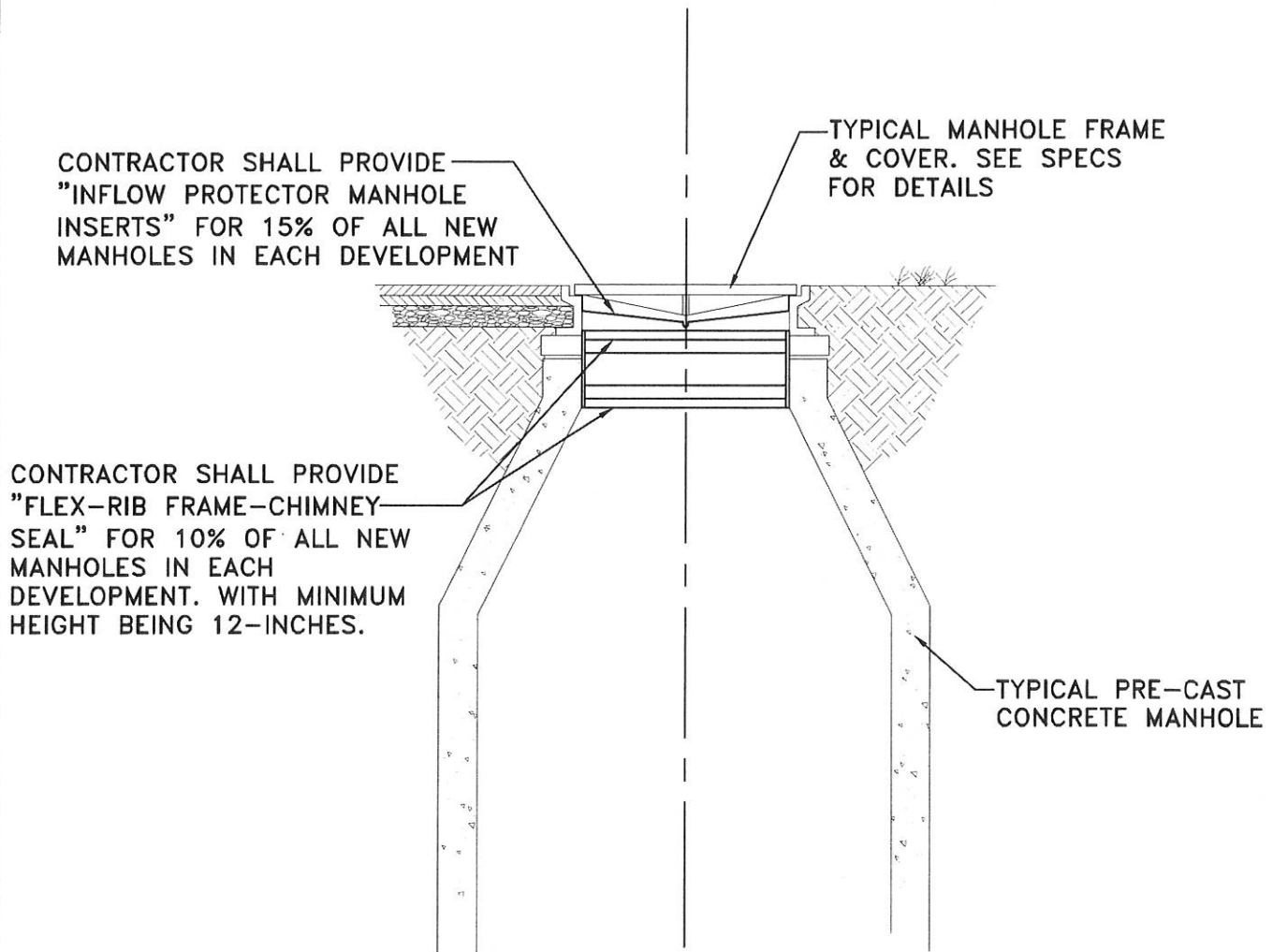
POINTS "A" SHOULD BE HIGHER THAN POINT "B".

PROPER PLACEMENT OF A FILTER BARRIER IN A DRAINAGE WAY

SILTATION FENCE

NOT TO SCALE

WMS# 13108

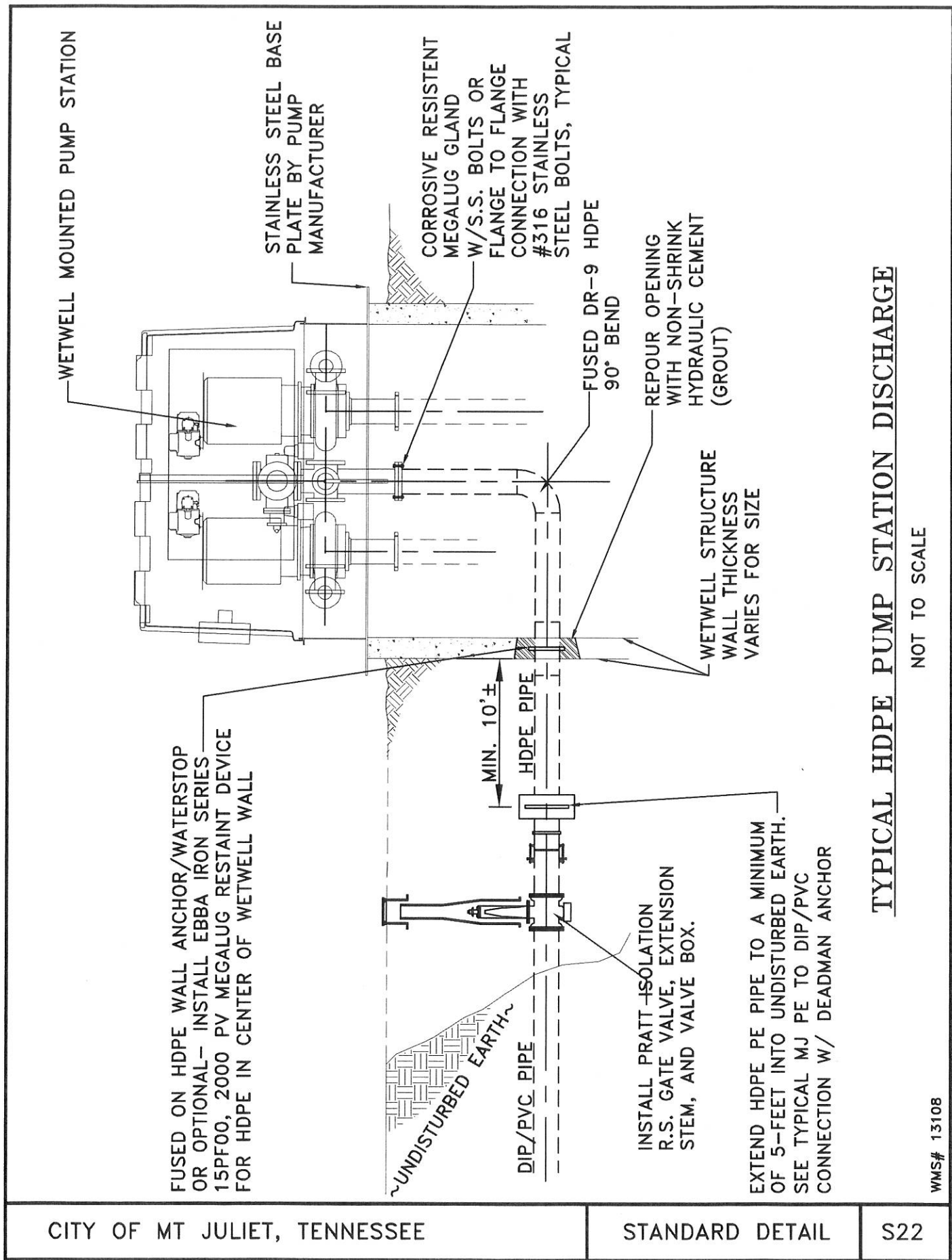


NOTE = INFLOW PROTECTORS ARE NOT INTENDED FOR WATERTIGHT MANHOLES OR END-OF-LINE MANHOLES. END-OF-LINE MANHOLES SHALL HAVE VENTED LIDS.

TYPICAL MANHOLE INSERTS &
FRAME-CHIMNEY SEALS

NOT TO SCALE

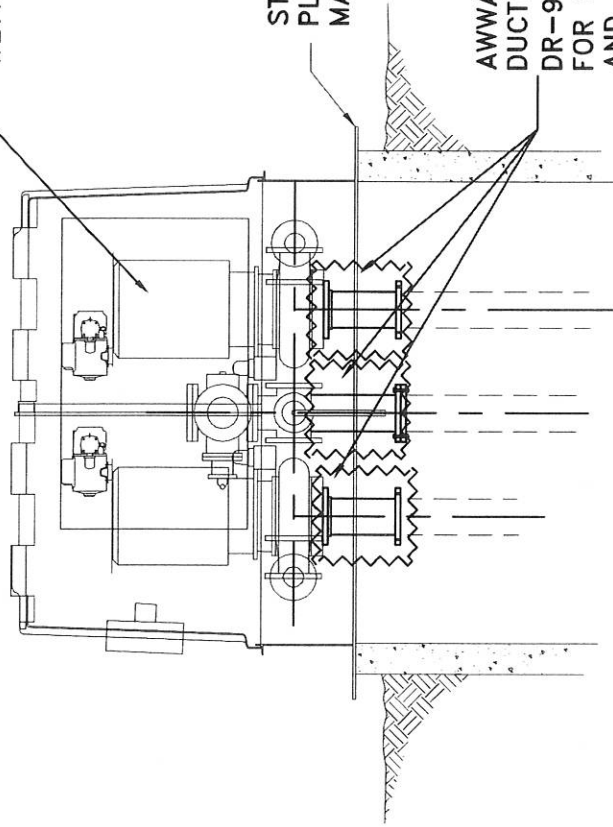
WMS# 13108



WETWELL MOUNTED PUMP STATION

STAINLESS STEEL BASE
PLATE BY PUMP
MANUFACTURER

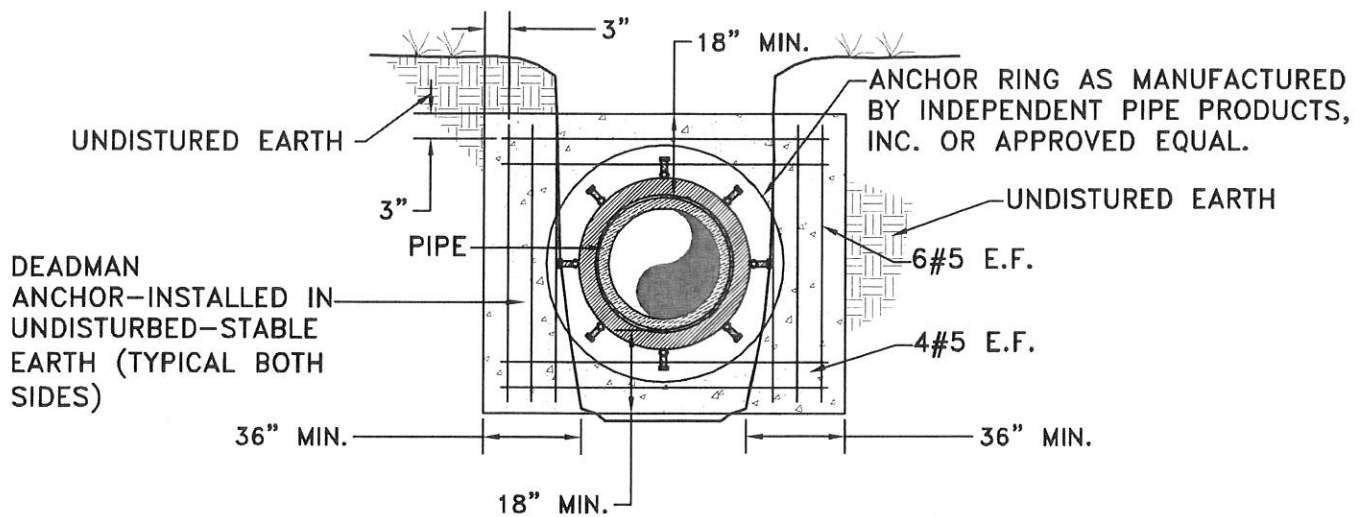
AWWA SERIES 4000-
DUCTILE IRON PIPE SIZE
DR-9 HDPE W/ BUTT FUSED FLANGES
FOR CONNECTION OF HDPE SUCTION
AND DISCHARGE PIPING OR FLANGED
PUMP STUB-OUTS BY MANUFACTURER
WITH PROTECTIVE COATING ALL BOLTS
SHALL BE #316 STAINLESS STEEL



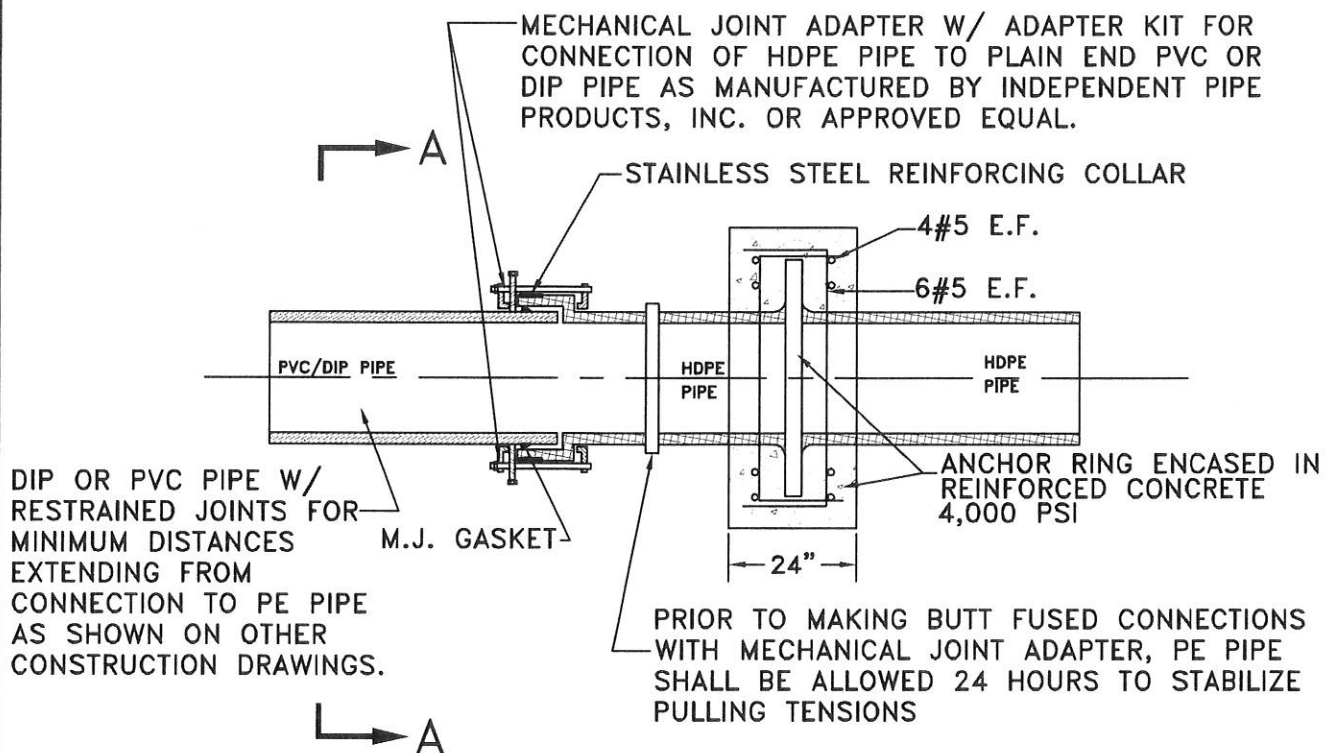
TYPICAL HDPE PUMP STATION CONNECTION

NOT TO SCALE

WMS# 13108



SECTION A-A



PLAN VIEW

TYPICAL MJ PE TO DIP OR PVC
CONNECTION W/ DEADMAN ANCHOR

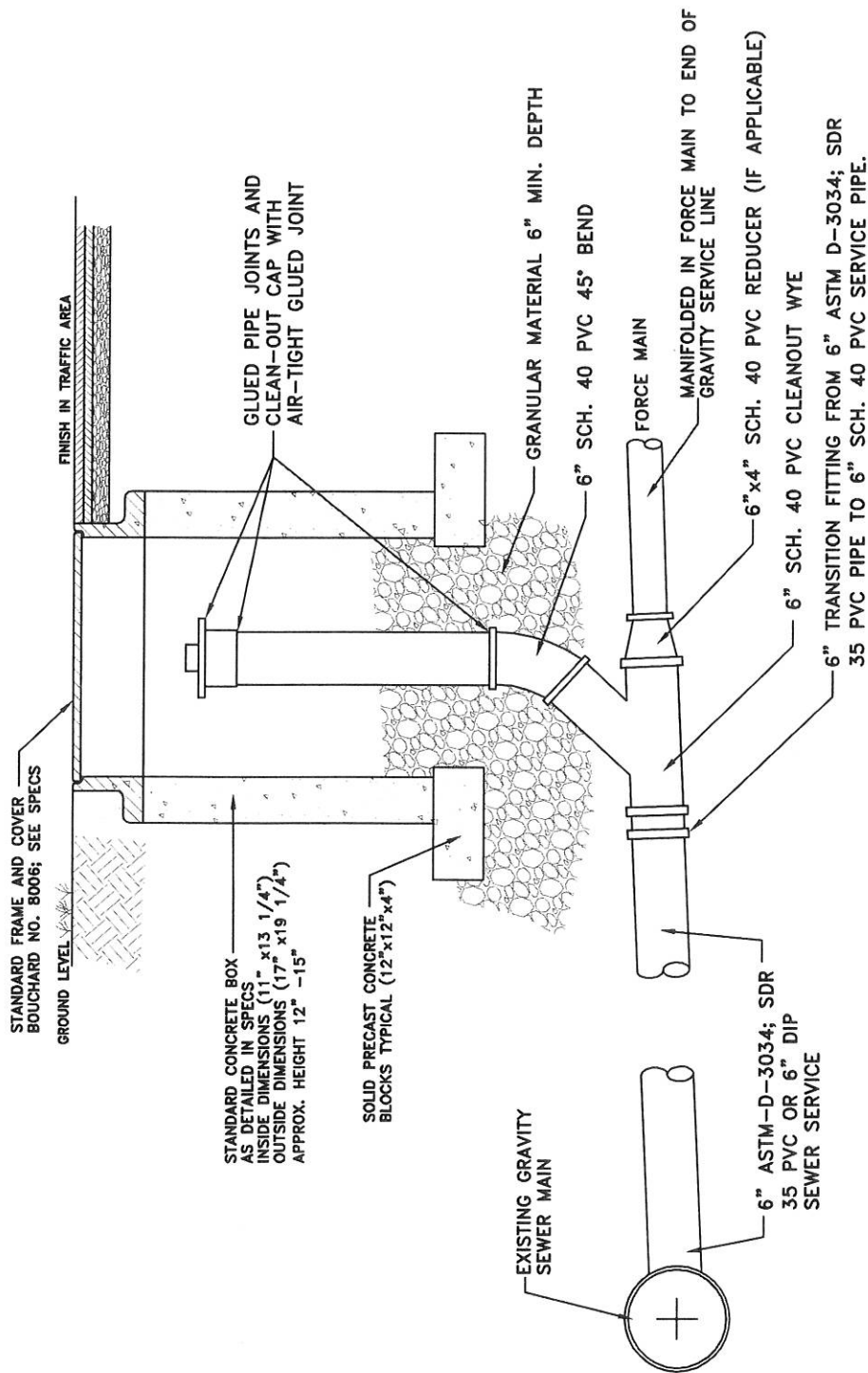
NOT TO SCALE

WMS# 13108



NOT TO SCALE

WMS# 13108



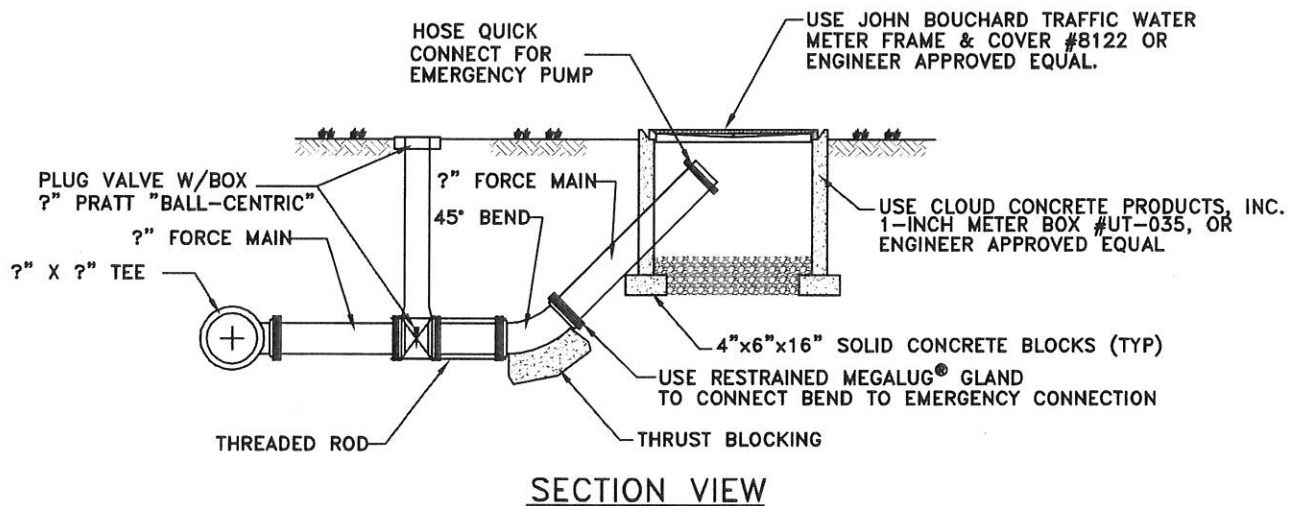
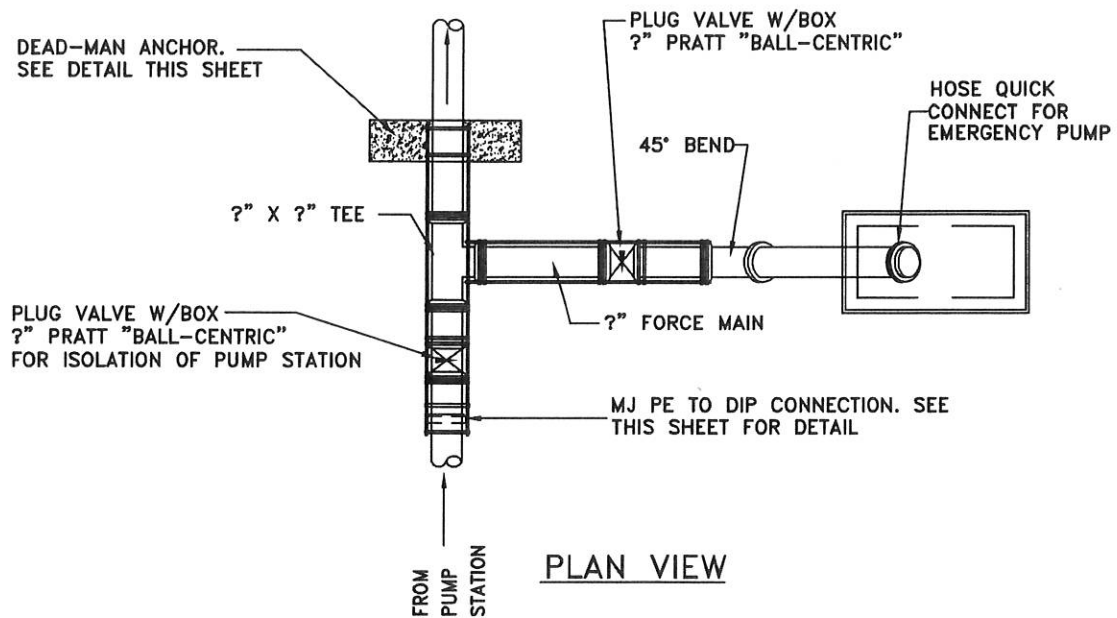
TYPICAL SHALLOW CLEANOUT ASSEMBLY W/ FORCE MAIN CONNECTION

NOT TO SCALE

WMS# 13108



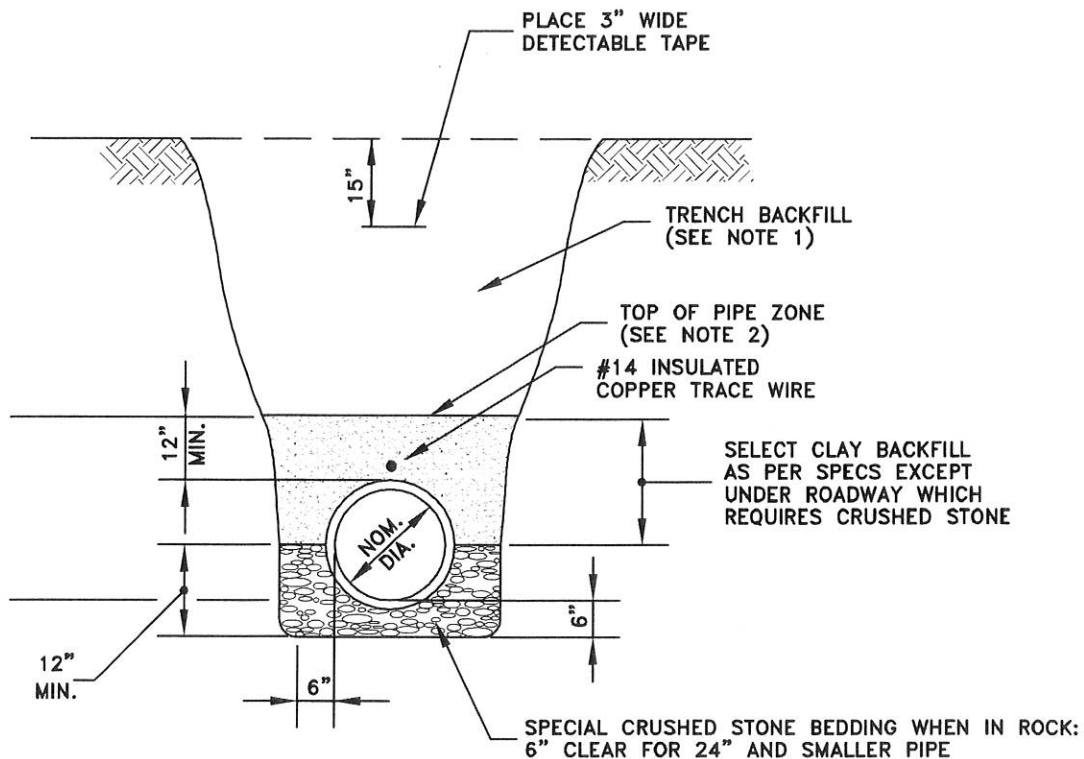
* IF APPROVED BY CITY OF LEBANON ENGINEERING DEPARTMENT FOR DEEP INSTALLATION



TYPICAL EMERGENCY
PUMPING CONNECTION DETAIL W/
CONCRETE ANCHOR AND PIPE CONNECTION

NOT TO SCALE

WMS# 13108



NOTES:

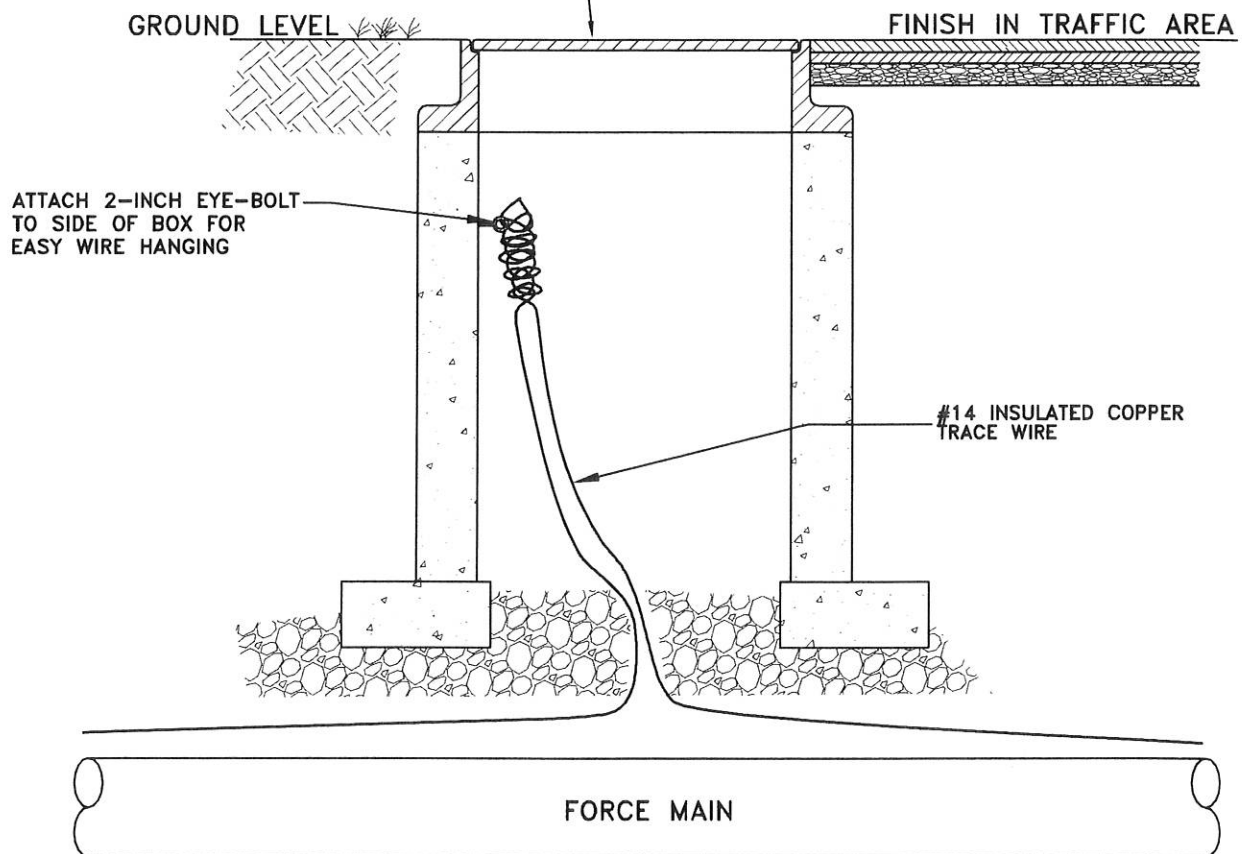
1. SEE PROJECT SPECIFICATIONS FOR BACKFILL REQUIREMENTS.
2. "PIPE ZONE" EXTENDS TO 12" ABOVE TOP OF PIPE AND IS AREA IN WHICH SPECIAL CARE IS TO BE GIVEN TO PLACEMENT AND COMPACTION TO PROTECT PIPE DURING AND AFTER LAYING.
3. TRENCH SHALL BE DUG TO GIVE PIPE FULL AND CONTINUOUS SUPPORT. ALL ROCK TO BE REMOVED TO WITHIN 6" OF PIPE - BED TO PIPE GRADE WITH CRUSHED STONE BEDDING. BEDDING FROM PIPE GRADE TO 1/2 PIPE DIAMETER TO BE CRUSHED STONE.
4. PIPE TO BE CONTINUOUSLY SUPPORTED ALONG LENGTH OF PIPE BARREL EXCEPT AT BELLS. BELL HOLES REQUIRED SUCH THAT NO BEARING LOAD IS TAKEN BY THE BELL.

TYPICAL FORCE MAIN OR PRESSURE SEWER PVC PIPE INSTALLATION

NOT TO SCALE

WMS# 13108

STANDARD FRAME AND COVER
BOUCHARD NO. 8006; SEE SPECS



NOTE: SPACE BOXES EVERY 400' EXCEPT WHEN A AUTOMATIC AIR/VACUUM RELEASE MANHOLE IS WITHIN 300-FT.

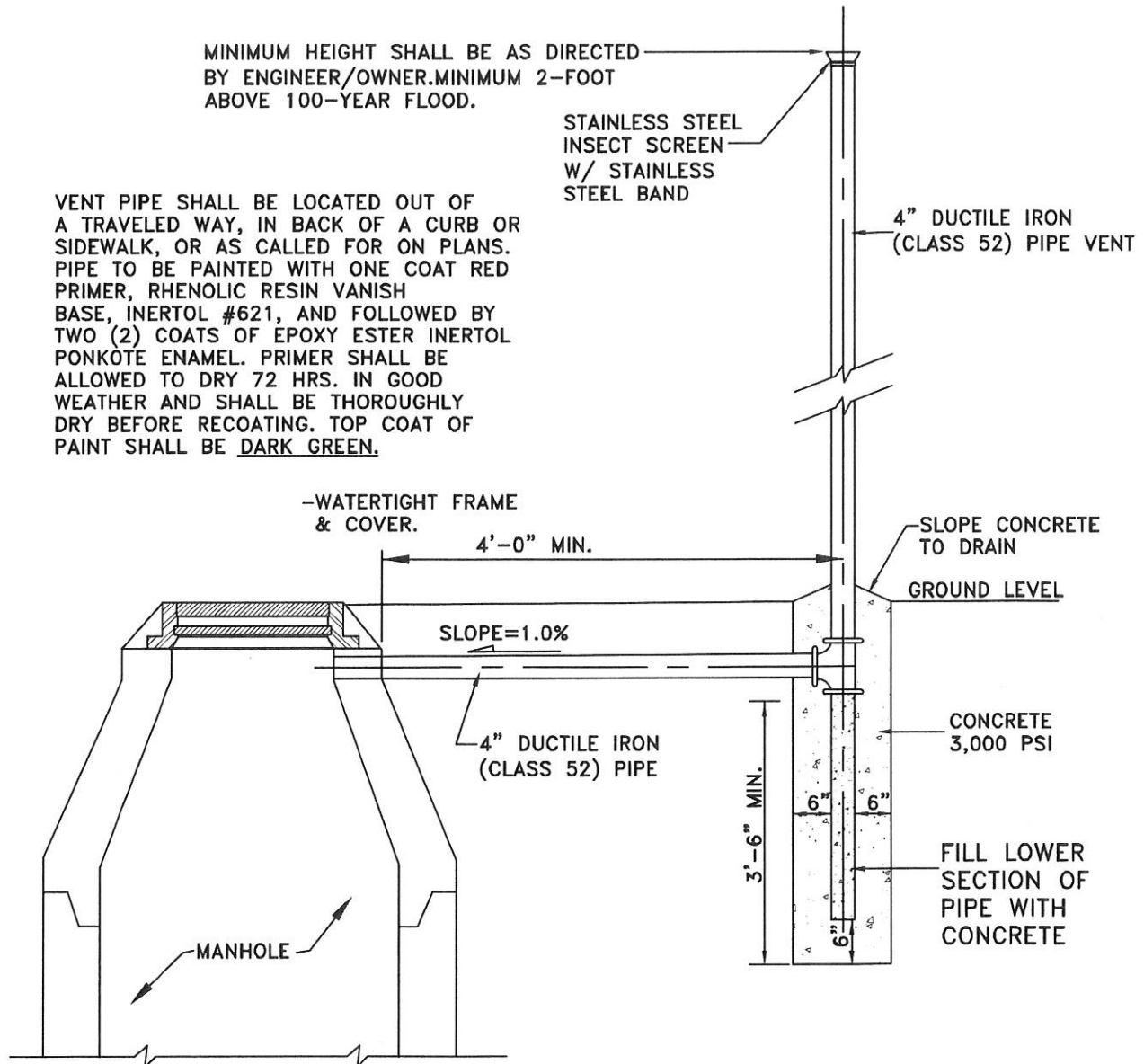
TYPICAL TRACE WIRE STUB-UP BOX
FOR FORCE MAINS

NOT TO SCALE

WMS# 13108

MINIMUM HEIGHT SHALL BE AS DIRECTED
BY ENGINEER/OWNER. MINIMUM 2-FOOT
ABOVE 100-YEAR FLOOD.

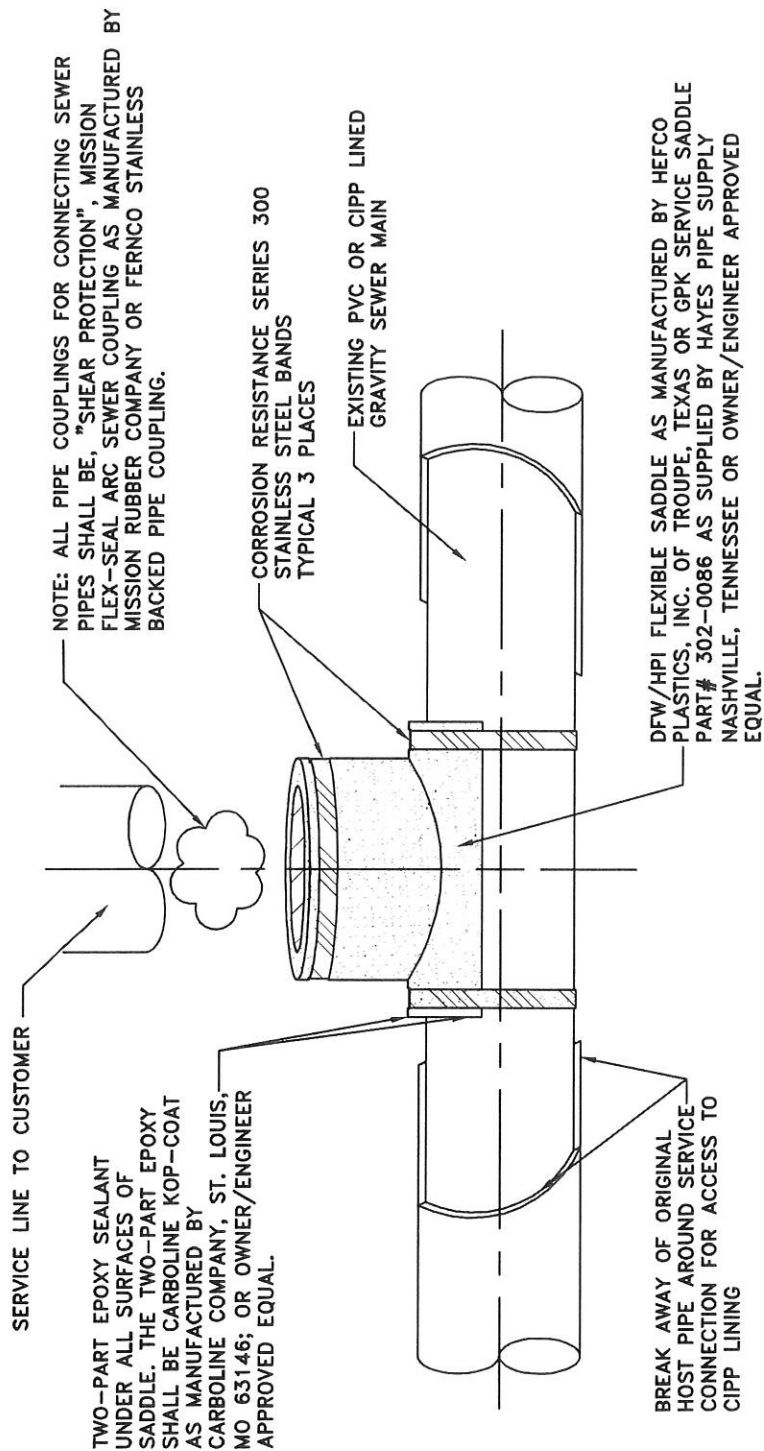
VENT PIPE SHALL BE LOCATED OUT OF
A TRAVELED WAY, IN BACK OF A CURB OR
SIDEWALK, OR AS CALLED FOR ON PLANS.
PIPE TO BE PAINTED WITH ONE COAT RED
PRIMER, RHEOLIC RESIN VANISH
BASE, INERTOL #621, AND FOLLOWED BY
TWO (2) COATS OF EPOXY ESTER INERTOL
PONKOTE ENAMEL. PRIMER SHALL BE
ALLOWED TO DRY 72 HRS. IN GOOD
WEATHER AND SHALL BE THOROUGHLY
DRY BEFORE RECOATING. TOP COAT OF
PAINT SHALL BE DARK GREEN.



MANHOLE VENT PIPE ASSEMBLY

NOT TO SCALE

WMS# 13108



"EPOXYED-ON" SEWER SERVICE SADDLE CONNECTION

NOT TO SCALE

WMS# 13108

DIVISION B

COLLECTION SYSTEM REHABILITATION

(Note: Division B consists of a reprint of Tennessee Division of Water Pollution Control "Design Criteria for Sewage Works," Chapter 17 – Collection System Rehabilitation)

2 April 1996

CHAPTER 17

Collection System Rehabilitation

17.1 Purpose

17.2 Definitions

17.3 General

17.4 Sub-basin Approach

17.5 Sub-basin Analysis

17.5.1 Repair Process

17.5.2 Service Laterals

17.5.3 Grout and Seal

17.5.4 Smoke Testing

17.5.5 Other Materials of Repair

17.6 Continuous Rehabilitation Program

| | |
|---------------|---|
| Appendix 17-A | Manhole Repair and Rehabilitation and Manhole Reconstruction by Lining |
| Appendix 17-B | Manhole Inspection Log |
| Appendix 17-C | TV Log |
| Appendix 17-D | Smoke Testing Log |
| Appendix 17-E | Sewer Line Cleaning Log |
| Appendix 17-F | Sewer Rehabilitation Priorities |
| Appendix 17-G | Sewer Reconstruction by Resin Impregnated Felt Cured-In-Place Lining and Other Lining Methods |

COLLECTION SYSTEM REHABILITATION

17.1 Purpose

This Chapter does not attempt to detail the physical repair of a collection system, but rather presents a philosophy on the overall procedure for effective rehabilitation. The use of this chapter will guide an engineer in developing a program to "catch-up" in the race against infiltration and inflow, and further provide municipalities guidance in the continuous rehabilitation needed to maintain the system.

17.2 Definition

Infiltration – The volume of groundwater entering sewers and building sewer connections from the soil through defective joints, broken or cracked pipe, improper connections, manhole walls, etc.

Inflow – The volume of any kind of water discharged into sewer lines from such sources as roof leaders, cellar and yard area drains, foundation drains, sump pumps, commercial and industrial "clean water" discharges, drains from springs and swampy areas, etc.

Infiltration/Inflow (I/I) – The volume of both infiltration water and inflow water found in existing sewer systems. Since the two sources are many times indistinguishable, it is impossible to determine the amounts of either.

17.3 General

The Division of Water Pollution Control recommends a broad two-tier approach to sewer rehabilitation. First, the municipality should attempt to "catch-up" the collection system maintenance to a degree such as if the maintenance had been performed steadily over the years. Once the system has been thoroughly rehabilitated to an acceptable level of flow reduction, the municipality should then be prepared to start over again with a program for continuous rehabilitation. The goal of the Continuous Rehabilitation Program is for the system to routinely identify, repair and re-examine their collection system in order to maintain the system in as good condition as possible from now on. The benefit of this approach is to spread the cost of maintenance over the life of the system (by budget) and reduce or slow the rise of the cost per gallon of treatment. Treatment costs are just as high to treat I/I water as they are to treat domestic sewage. Repairing sewage systems and effectively reducing I/I is challenging, difficult and demanding. A successful rehabilitation effort requires both knowledge and persistence. Cities should not wait for grant dollars to begin this effort but should commit resources to begin a program and evolve the program into an effective I/I reduction goal.

17.4 Sub-Basin Approach

Success or failure of a rehabilitation program should not be judged by looking at flows only at the treatment plant. When the flow rate is based on a single point measurement of the system, such as the entrance to the plant (except for very small collection systems), the increments of reduction are too small to notice for quite some time. The flow is averaged in the overall system as to both infiltration/inflow and flow contributed from sanitary wastes. The one-point plant approach also does not differentiate the intact areas of the system which require no renovation and rehabilitation from the extremely poor areas which would benefit from rehabilitation. The only way to accomplish such a differentiation is to use a sub-basin approach.

5. Make a "second pass" over the sub-basin locating and repairing remaining I/I sources

Phase III – Evaluation

1. Monitor wet weather flows, record data
2. Determine I/I reductions
3. Document costs and completed repairs
4. Move to next sub-basin or begin the Continuous Rehabilitation Program

17.5.2 Service Laterals

Working on service laterals cannot be overemphasized. Once the leaks are repaired in the mains, the ground water level in the trench elevates and inundates sections of the laterals. Without repair, the service laterals will leak just as badly as the mains. Using a TV camera during high ground water conditions, crews should attempt to identify leaking laterals. Only the leakers should be inspected further. Most problems are encountered either at the main/lateral junction or within the first six (6) feet off the main. Equipment is available to grout a short section of service lateral from the main.

17.5.3 Grout and Seal

On grout sealing contracts, the municipality should require the contractor to retest at least 5% of the joints that were grouted, after the job is complete. If more than one joint between manholes fails, the contractor should pay for the retest and repair. If many roots are present on a line, it is best to dig up and replace the line. Grouting is short-lived where roots are a bad problem. Minor root problems may be treated chemically and then sealed.

Grout selection is very important. Grouts that depend upon the presence of water to maintain their integrity, though cheaper and less toxic to handle, may not be as long lived. If the ground water table drops down below the grade of the sewer long enough for the soil surround the sewer line to dry out, these grouts shrink and can leak more than before the grouting was done. The urethane foam grouts are a durable product that will maintain their seal whether water is present or not. The best advice is to talk to a number of manufacturers and weigh the pros and cons on each product.

17.5.4 Smoke Testing

Most leak detection work must be done while it is raining or immediately following a rain. However, smoke testing can be useful during low rainfall seasons for locating roof and area drain connections. Because work is often done at night or under poor working conditions, all manholes should be located and daylighted ahead of time.

Close attention to field procedure is important when conducting a smoke testing program. Each sewer line segment in the sub-basin to be tested should be tested with a blower at both the upstream and downstream manholes. Blowers should be run at full throttle to obtain the best results.

2 April 1996

CHAPTER 17
APPENDIX A
SECTION 02730

MANHOLE REPAIR AND REHABILITATION

PART I – GENERAL

1.01 RELATED DOCUMENTS

- A. Section 01530: Barriers
- B. Section 01560: Temporary Controls
- C. Section 01570: Traffic Regulations
- D. Section 01710: Cleaning
- E. Section 02610: Paving
- F. Section 02722: Sanitary Sewer, Force Main and Appurtenances

1.02 JOB CONDITIONS

- A. Immediately notify the Engineer of any unexpected or unusual conditions. Discontinue work until Engineer provides notification to resume work.
- B. All work in streets and roadways shall be conducted in strict accordance with provisions of Section 01570.
- C. Bypass pumping of sewage will be allowed only as provided in the Project Work Schedule and approved in writing by the Owner.

1.03 QUALITY ASSURANCE

- A. Adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work specified in this Section shall be used.
- B. Equipment adequate in size, capacity and numbers to accomplish the work in a timely manner shall be used.
- C. Contractor shall provide adequate on-the-job supervision of all work and workmen to assure the work meets all requirements of the Contract.

1.04 SUBMITTALS

- A. Contractor shall supply a list of all materials proposed for use under this Section including copies of the manufacturers' descriptive literature.
- B. Submit six (6) copies of the required documents in accordance with Section 01340.

- C. Clean all interior surfaces by hand and with high-pressure "clean" water to remove all loose, deteriorated and/or foreign materials.
- D. Wash all interior surfaces with approved solution of Muriatic or hydrochloric acid.
- E. Repeat Step C.
- F. Chipping smaller cracks and loose material may be necessary to provide proper placement and bonding of plugging materials.
- G. Controlled diversion or bypass pumping of the sewage shall be incorporated if required to accommodate a satisfactory reconstruction.

3.02 MAJOR MANHOLE REHABILITATION

- A. See "Manhole Rehabilitation Log" in the Project Plans for listing of manhole information and categories.
- B. Major Manhole Rehabilitation shall include complete restoration of manholes in fair to poor condition. Manholes in this category shall have a rating of three (3) or greater for "physical Condition" and ratings of two (2) or four (4) for leaking.
- C. Manhole restoration shall consist of:
 - 1. Correct all visible leaks by use of approved hydraulic cement, drilling and pressure grouting (approved grout only), or other approved methods.
 - 2. Repair, reshape or replace invert area.
 - 3. Depressions, holes and very rough areas shall be smoothed with hydraulic cement or thickened mixes of synthetic coating material to provide a surface leveled to a maximum of 1/2-inch roughness.
 - 4. Interior coatings may be applied by "Brushing" or approved "Spraying" methods.
 - 5. Coat interior surface with one (1) coat of approved white coating material and allow minimum curing time and proper curing conditions.
 - 6. Apply second (2nd) layer of approved gray coating materials within allowable time to assure proper bond and curing.
 - 7. Allow recommended final curing time and provide recommended curing conditions.
 - 8. Reset or replace frame and cover as specified.
 - 9. Cast iron frames shall be set in a bed of Butyl rubber flexible joint sealant and secured with anchors as specified and shown in the Project Details.

3.03 MINOR MANHOLE REHABILITATION

- A. See "Manhole Rehabilitation Log" in the Project Plans for listing of manhole information and categories.
- B. Minor Manhole Rehabilitation shall include complete restoration of manholes in good to moderate condition. Manholes in this category shall have a rating of two (2) or less for "Physical Condition" and ratings of zero (0), one (1), or three (3) for "Leaking."

2. Manholes failing the vacuum test two (2) times may, at the discretion of the Owner, be allowed to be hydrostatically tested by an exfiltration test for acceptance.
 3. The Owner may require complete replacement of any manhole failing three (3) leak tests. Replacement shall be at no cost to the Owner.
- E. The Contractor shall furnish all equipment and personnel to conduct the tests in the presence of the Engineer.
 - F. Costs for all testing shall be included within and incidental to the Contract Unit Price for manhole repair and rehabilitation.
 - G. Repairing, retesting, pressure grouting and/or replacement of defective manholes shall be at the sole cost and responsibility of the Contractor and shall be pursued in a timely manner to prevent disruption to the Project and/or sewer services.
 - H. Manholes moved, displaced and/or damaged in any way during finishing and/or backfilling operation subsequent to successful testing shall be retested for acceptance as specified above at the sole cost of the Contractor.

END OF SECTION

SECTION 02731

MANHOLE RECONSTRUCTION BY LINING

PART I – GENERAL

1.01 RELATED DOCUMENTS

- A. Section 01530: Barriers
- B. Section 01560: Temporary Controls
- C. Section 01570: Traffic Regulations
- D. Section 01710: Cleaning
- E. Section 02610: Paving
- F. Section 02722: Sanitary Sewer, Force Main and Appurtenances

1.02 JOB CONDITIONS

- A. Immediately notify the Engineer of any unexpected or unusual conditions. Discontinue work until Engineer provides notification to resume work.
- B. All work in streets and roadways shall be conducted in strict accordance with provisions of Section 01570.
- C. Bypass pumping of sewage will be allowed only as provided in the Project Work Schedule and approved in writing by the Owner.

1.03 QUALITY ASSURANCE

- A. Adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work specified in this Section shall be used.
- B. Equipment adequate in size, capacity and numbers to accomplish the work in a timely manner shall be used.
- C. Contractor shall provide adequate on-the-job supervision of all work and workmen to assure the work meets all requirements of the Contract.

1.04 SUBMITTALS

- A. Contractor shall supply a list of all materials proposed for use under this Section including copies of manufacturers' descriptive literature.
- B. Calculations
 - 1. Contractor shall supply calculation for thickness(es) for each manhole scheduled for reconstruction by lining method.
 - 2. Contractor shall secure Engineer's approval prior to beginning work.
- C. Submit six (6) copies of the required documents in accordance with Section 01340.

Type B-Butyl Rubber and as follows: maximum of 1% volatile matter and suitable for application temperatures between 10 and 100 degrees F.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Remove manhole casting if schedule for repair or replacement.
- B. Inspect manholes before beginning high-pressure wash to identify scope of work, to confirm actual depth for payment purposes, and to confirm rehabilitation category.
- C. Clean all interior surfaces by hand and with high-pressure "clean" water to remove all loose, deteriorated and/or foreign materials.
- D. Wash all interior surfaces with approved solution of Muriatic or hydrochloric acid.
- E. Repeat Step C.
- F. Chipping smaller cracks and loose material may be necessary to provide proper placement and bonding of plugging materials.
- G. Controlled diversion or bypass pumping of the sewage shall be incorporated if required to accomplish a satisfactory reconstruction.

3.02 MAJOR MANHOLE REHABILITATION

- A. See "Manhole Rehabilitation Log" in the Project Plans for listing of manhole information and categories.
- B. PREPARATION
 - 1. Leaks and flowing water into the manhole shall be plugged and approved - Type "A" materials and techniques.
 - 2. The manhole invert shall be replaced and/or repaired, and voids, depressions and deep rough areas around pipe entrance and in the manhole walls shall be repaired to provide a leveled surface to maximum of 1/4-inch roughness.
- C. LINING APPLICATION
 - 1. Lining system may be applied to damp, but not wet surfaces.
 - 2. The lining shall be applied by approved appropriate spray techniques to the interior manhole surfaces by trained/experienced technicians.
 - 3. The liner placement shall be in strict accordance with methods approved prior to beginning the work.
 - 4. The finish liner thickness(es) shall be in accordance with the calculated required thickness(es) to a tolerance of minus 0/8th inches to a plus 2/8th inches.

Appendix 17-A

The following materials have been previously approved by the STATE OF TENNESSEE as acceptable for use in the STATE:

- 1) 9 April 1991 K M Inliner II (also known as Inliner USA)
- 2) 17 May 1991 U-Liner
- 3) 6 September 1991 Nu Pipe (folded form of Insituform)
- 4) Insituform 1987
- 5) Ultraliner April 1995
- 6) PipeTec Expanda Pipe April 1995
- 7) AMLINER April 1995

Appendix 17-B

[illegible]

| | | | | | |
|---|--|--|--|----------------------------|--|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> MH </div> <div style="text-align: center;"> TV </div> <div style="text-align: center;"> FLOW </div> <div style="text-align: center;"> MH </div> </div> | | DATE: _____ TV LOG _____ CITY OF: _____ | | ENGINEER: _____ | |
| LOCATION: _____ | | MAP NO. _____ | | | |
| FROM MH NEW _____ TO MH NEW _____ JT. L PIPE L _____ SIZ _____ P. TYPE _____ | | MAP NO. _____ | | | |
| TAPE NO. _____ | | TAPE COUNTER NO. _____ | | | |
| MAIN | | REHA REPLACE | | | |
| STATION | | TV REMARKS | | CORRECTION REMARKS | |
| SERVICE POS. | | EST. FLOW (GPM) | | REHA REPLACE | |
| COLLAPSED PIPE | | LEAKING FROM PIPE | | POINT REPAIR | |
| BROKEN PIPE | | ROOTS AT JOINT | | GROUT | |
| CRACKED PIPE | | DEFECTIVE JOINT | | OTHER | |
| DETERIORATED PIPE | | OFFSET JOINT | | REPLACE | |
| DROP JT/SHEAR | | DEFECTIVE TAP | | FORM IN PLACE | |
| ROOTS IN SERVICE | | PROTRUDING PIPE | | SLIP LINE | |
| (1) L, (2) M, (3) H | | LEAKING MH | | OTHER | |
| SWAG IN PIPE | | WILL NOT PASS | | OTHER | |
| CAMERA SUMMERGED | | LEAKING AROUND PIPE | | OTHER | |
| GEN. | | MH | | REHA REPLACE | |
| III | | III | | REHA REPLACE | |
| 1 | | 2 | | 3 | |
| 4 | | 5 | | 6 | |
| 7 | | 8 | | 9 | |
| 0 | | 1 | | 2 | |
| 3 | | 4 | | 5 | |
| 6 | | 7 | | 8 | |
| 9 | | 0 | | 1 | |
| 2 | | 3 | | 4 | |
| 3 | | 4 | | 5 | |
| 4 | | 5 | | 6 | |
| 5 | | 6 | | 7 | |
| 6 | | 7 | | 8 | |
| 7 | | 8 | | 9 | |
| 8 | | 9 | | 0 | |
| 9 | | 0 | | 1 | |
| 0 | | 1 | | 2 | |
| 1 | | 2 | | 3 | |
| 2 | | 3 | | 4 | |
| 3 | | 4 | | 5 | |
| 4 | | 5 | | 6 | |
| 5 | | 6 | | 7 | |
| 6 | | 7 | | 8 | |
| 7 | | 8 | | 9 | |
| 8 | | 9 | | 0 | |
| 9 | | 0 | | 1 | |
| 0 | | 1 | | 2 | |
| 1 | | 2 | | 3 | |
| 2 | | 3 | | 4 | |
| 3 | | 4 | | 5 | |
| 4 | | 5 | | | |

Appendix 17 -D

SMOKE TESTING LOG

DATE: _____

TIME: _____

PROJECT NO: _____

LEGEND: X - MAIN LINE
Y - LATERAL
Z - ROOF LEADER
M - MANHOLE
H - INSIDE HOUSE

1-SLIGHT
2 - MODERATE
3 - HEAVY

LEAK No'S

INI - SYSTEM: _____
 (NEW) (OLD)

BLOWER LOACTION: M. H.

REMARKS _____

(SKETCH)

Date: 11-22-94

KEY SHEET #: _____

Appendix 17-E

LOG SEWER LINE CLEANING

Map No. _____ Date Cleaned _____ By _____
 Up Str MH : Old _____ New _____
 Dn Str MH: Old _____ New _____
 Mini-System: Old _____ New _____
 Line Size: inches _____

Cleaning Summary:

Line Material:

Normal _____ Heavy Roots _____
 Heavy Sed. _____ Light Roots _____
 Large Rx.-Brick _____ Mach. Cleaned _____
 Grease _____ Hand Cleaned _____
 Broken Pipe _____ Other _____

Remarks: _____

Date 11-22-94

APPENDIX 17F
SEWER REHABILITATION

Priority I

- ◆ Point Repair, Replace or Liner – to stop active water flow
- ◆ Lines located in the immediate area of storm sewers or ditches

Priority II

- ◆ Point repair of liner to seal or repair offset joints, root intrusion, broken pipe leaking noted, but no active flow noted
- ◆ Lines located in areas not adjacent to storm sewers or ditches

Priority III

- ◆ Lines that did not exhibit the number and/or severity of problems noted for Priorities I or II at the time of investigation

Priority IV

- ◆ Lines found to be in good condition at the time of investigation
- ◆ Chapter 17 – Appendix F

Date 2 April 1996

SECTION 02750

SEWER RECONSTRUCTION BY RESIN IMPREGNATED FELT
CURED-IN-PLACE LINING OR OTHER LINING METHODS

PART 1 – GENERAL

1.01 REQUIREMENTS

- A. Reconstruction of sewer lines by resin impregnated felt cured-in-place lining; installation of a continuous polyethylene (PE) liner; or folded form of polyvinyl chloride (PVC) inserted into an existing sewer.
- B. The finished pipe shall be continuous from manhole to manhole and be sealed at the beginning and ending manholes

1.02 RELATED DOCUMENTS

- A. Section 01310: Construction Schedules
- B. Section 01340: Shop Drawings, Product Data and Samples
- C. Section 01530: Barriers
- D. Section 01560: Temporary Controls
- E. Section 01570: Traffic Regulations
- F. Section 02221: Trenching, Backfill and Compaction
- G. Section 02772: Sanitary Sewers, Force Mains and Appurtenances

1.03 SUBMITTALS

- A. Submit certified product data for:
 - 1. Resin Impregnated Felt Cured-In-Place Lining
 - 2. Polyethylene Pipe
 - 3. Folded Form of PVC
 - 4. Sealing Rope
 - 5. Foam Type Chemical Grout
 - 6. Couplings
 - 7. Service Saddles
 - 8. Silicone Adhesive
 - 9. Rapid Setting Hydraulic Cement
- B. Submit six (6) copies of required documents in accordance with Section 01340.
- C. Submit six (6) copies of the proposed construction schedules within fourteen (14) calendar days of the Notice to Proceed.
- D. Submit testing and inspection data as outlined in this Section.

1.04 REFERENCES

- A. ASTM-03350